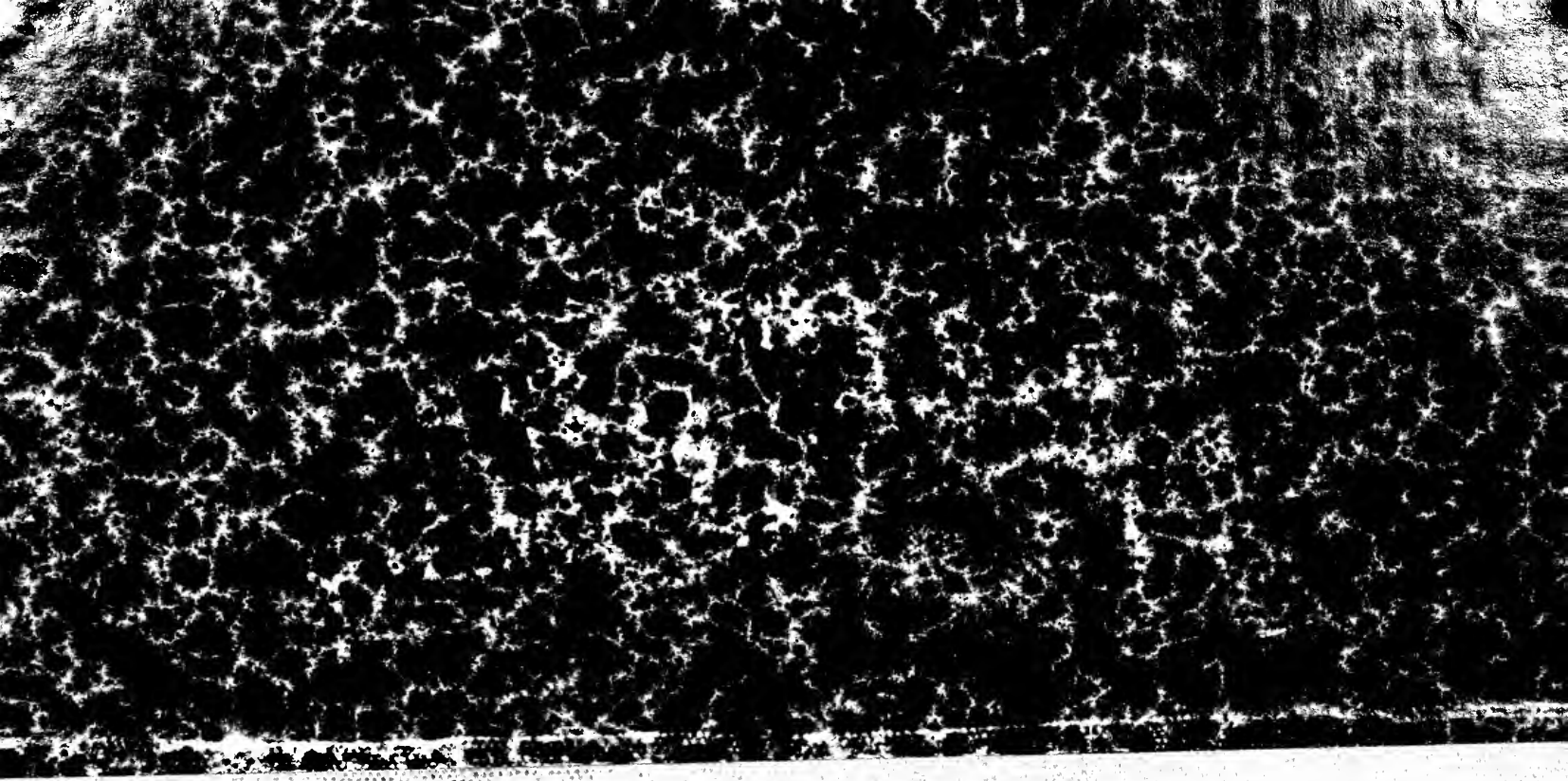

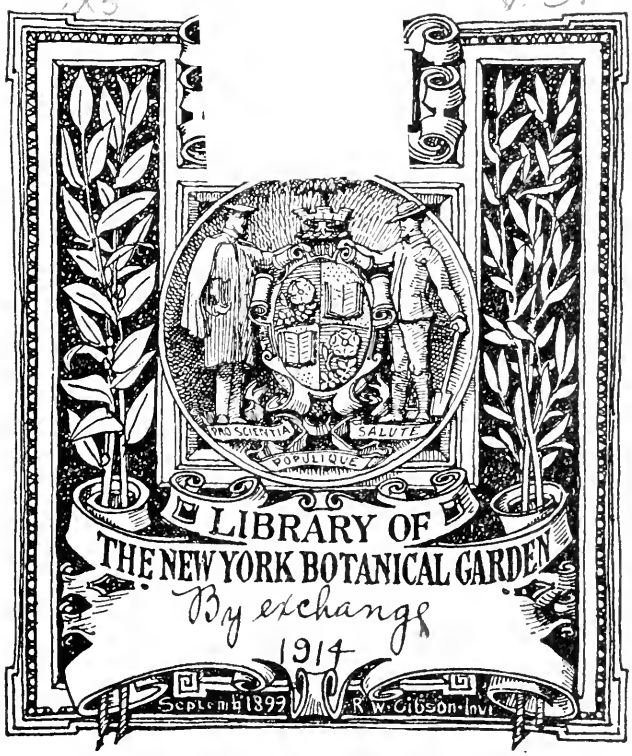

U. S. DEPARTMENT OF AGRICULTURE
OFFICE OF EXPERIMENT STATIONS
A. C. TRUE, DIRECTOR

EXPERIMENT STATION RECORD

VOLUME XXXI

JULY–DECEMBER, 1914

WASHINGTON
GOVERNMENT PRINTING OFFICE
1915

U. S. DEPARTMENT OF AGRICULTURE.

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EXPERIMENT STATION RECORD.

Editor: E. W. ALLEN, Ph. D., *Assistant Director.*
Assistant Editor: H. L. KNIGHT.

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Agricultural Chemistry and Agrotechny—L. W. FETZER, Ph. D., M. D.
Meteorology, Soils, and Fertilizers—W. H. BEAL. R. W. TRULLINGER.
Agricultural Botany, Bacteriology, and Plant Pathology—W. H. EVANS, Ph. D. W. E. BOYD.
Field Crops—J. I. SCHULTE. G. M. TUCKER, Ph. D.
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Rural Economics—E. MERRITT.
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Indexes—M. D. MOORE.

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U. S. Department of Agriculture.

EXPERIMENT STATION RECORD.

VOL. XXXI. JULY, 1914. No. 1.

With the continued enlargement and extension of the functions of the United States Department of Agriculture, the annual appropriation act providing for its support has become more and more a measure of much public interest. The latest of these acts, signed by President Wilson June 30, 1914, and carrying appropriations for the fiscal year commencing with the following day, is no exception in this respect, again establishing as it does the principle of federal aid to agriculture in the broadest use of the term, providing for the maintenance and development of its manifold activities to a larger extent than ever before, and opening the way to an increased efficiency through a reorganization of its work.

The total amount carried by the act is $19,865,832. This is an increase of $1,878,887, or over 11 per cent, over the previous year, and of $804,500 over the estimates submitted by the Department. The increased allotments are distributed throughout the entire Department, and while many are designed to provide more adequately for its administrative and regulatory functions, which now absorb nearly two-thirds of the total appropriations, opportunity is also afforded for the extension of most of its lines of research, and especially for the development of its various forms of demonstration work.

In its general make-up, the law conforms closely to its immediate predecessor, and in fact is somewhat more rigidly confined to the routine work of the Department. There are, however, a number of items of new legislation. Thus, the Secretary of Agriculture is directed to prepare a plan for "reorganizing, redirecting, and systematizing the work of the Department of Agriculture as the interests of economical and efficient administration may require." This plan is to be submitted to Congress with the estimates of expenditures for the fiscal year 1915–16, these estimates being arranged on the basis of its provisions. A special object of the proposed reorganization is the elimination of the possibility of duplication, and the securing of close coordination of related lines of work.

Another provision increases the maximum salary which may be paid to investigators or others engaged in scientific work from

$4,000 to $4,500. Under the previous limit, a number of the more experienced investigators have been drawn away from the Department.

By a clause inserted in the section dealing with the Office of Experiment Stations, funds are given the Secretary of Agriculture to carry out the provisions of the Smith-Lever Extension Act. An extension of the franking privilege is also included under which all correspondence, bulletins, and reports for the furtherance of the purposes of that act may be transmitted in the mails free of postage by the college officer or other person connected with the extension department of the college designated by the Secretary of Agriculture, under regulations to be prescribed by the Postmaster General.

Great interest was again manifested in the demonstration and extension activities conducted by the Department itself, and some of the largest increases carried in the act are those for their further development. The sum of $400,000 is definitely allotted to farmers' cooperative demonstration work outside the cotton belt, and $673,240 for similar demonstrations in the areas threatened by the boll weevil. In the case of the latter work, a proviso is inserted restricting the expenditures to the funds provided and such cooperative funds as may be voluntarily contributed by state, county, and municipal agencies, associations of farmers and individual farmers, universities, colleges, boards of trade, chambers of commerce, other local associations of business men, business organizations, and individuals within the State. The allotment for the campaign against the cattle tick is increased from $325,000 to $400,000, of which $50,000 may be used for live stock demonstration work in areas freed of ticks. There is also an appropriation of $60,000 for experiments and demonstrations in cooperation with States or individuals in live stock production in the cane sugar and cotton districts, and one of $40,000 to aid in the agricultural development of the government reclamation projects by assisting settlers through demonstrations, advice, and in other ways.

Most of the various regulatory or police functions assigned to the Department receive increased support. The permanent appropriation of $3,000,000 for meat inspection is supplemented by a grant of $375,000, an increase of $175,000 over the previous year. This increase is mainly because of additional work through the inspection of imported meats, in accordance with the Tariff Act of 1913. The meat inspection is also extended to reindeer. The allotment for the enforcement of the Food and Drugs Act is increased by $25,641, largely to meet the additional duties imposed by the recent extension of the act to include meat and meat food products and the amendment requiring the declaration of the net

weight in package and similar goods. An increase from $10,000 to $50,000 is provided for the protection of migratory game and insectivorous birds, and one from $75,000 to $100,000 for the cooperative fire protection of the forested watersheds of navigable streams. The appropriation for the enforcement of the plant quarantine act is increased from $40,000 to $50,000, with $50,000 additional to enable cooperation with States quarantined against the interstate movement of Irish potatoes.

As usual there is considerable new legislation relating to forestry matters. The Appalachian Forest Reserve Act of 1911 is amended by increasing the proportion of the gross receipts from the National Forests acquired under its provisions which is returned to the respective States and counties, for the benefit of their public schools and roads, from five to twenty-five per cent. Provision is also made for the handling through the Treasury Department of funds contributed for cooperative work in the protection and improvement of the National Forests, as well as for forest investigations, and a requirement is inserted whereby all such contributions must annually be reported to Congress.

The appropriation for studies of the marketing and distribution of farm products is increased from $50,000 to $200,000. Authority is also given the Department for studies of cooperation among farmers in the United States in rural credits and other lines and to disseminate information on the subject, with an appropriation of $40,000 for the purpose.

Other new projects for which definite appropriations are made include $10,000 for the importation of Corriedale and other sheep for breeding purposes; $5,000 for studying the grading, weighing, and handling of naval stores; $7,000 for the publication of reports and maps dealing with the location, extent, etc., of the kelp beds on the Pacific Coast; $10,000 for furnishing official cotton grades and samples to certain associations; $5,000 for the improvement of an additional game preserve; and $5,000 for agricultural extension work in Hawaii. Authority is also given for studies of seismology, a number of new insects and plant diseases, the handling of fish, oysters, and other foods and food products, and the utilization of agricultural products for clothing and other uses in the home. An exhibit by the Department, illustrative of farming in the subhumid regions, is provided for the International Dry Farming Congress to be held at Wichita, Kansas, October 7 to 17, 1914, with an appropriation of $20,000 for the purpose.

Considering the appropriations definitely allotted to the several Bureaus, that of the Weather Bureau aggregates $1,667,270. This is an apparent decrease of $40,340, but this is mainly because no new

observatories are provided except a building at Neah Bay, Washington, to cost $3,000. The allotments of the Bureau have been classified on a new basis, $327,270 being available for statutory salaries; $122,000 for carrying on investigations in meteorology, climatology, seismology, evaporation, and aerology, and the dissemination of meteorological, climatological, and marine information in the city of Washington; $1,189,000 for similar expenses outside of Washington; and $26,000 for the maintenance of a Bureau printing office in Washington. The Secretary is also directed to report to Congress relative to the future disposition of the plant at Mount Weather, Virginia, from which the extensive research work formerly carried on is being largely withdrawn.

An increase of $288,830 is accorded the Bureau of Animal Industry, making its total $2,320,026. This is in addition to the permanent annual appropriation of $3,000,000 for meat inspection previously referred to and also to a special appropriation of $600,000, approved Februay 23, 1914, of which $50,000 was allotted to the inspection of virus, serums, etc., used in the treatment of animal diseases, $100,000 for the investigation, treatment, and eradication of dourine, and the remainder for similar work with hog cholera. Among the largest items of increase in the Bureau's appropriation are those supplementing the meat inspection funds and for the tick eradication campaign already mentioned, and for work in dairying which receives $256,490, an increase of $78,590. The various items pertaining to animal husbandry are combined into a single group aggregating $182,840, of which $30,000 may be used for the horse breeding project, $24,500 for the poultry studies, including the ostrich industry, and $10,000 for sheep importation. The appropriation for inspection and quarantine work is $625,520, and that for pathological investigations of animal diseases $77,360.

The Bureau of Plant Industry receives $3,616,045. This is an increase of $948,050, about two-thirds of which is accounted for by the large additions to the funds for demonstration purposes previously mentioned, and the remainder chiefly by smaller increases apportioned among a large number of projects. The congressional seed distribution is continued on the usual basis and with an appropriation of $257,000, as for the previous year. The Bureau also receives $166,500 for the testing and distribution in quantities sufficient for practical field tests of new and rare seeds which from previous trials seem especially promising, and for the improvement of alfalfa, clover, and other forage crops, $100,000 of this amount being available for the purchase and distribution of these new and rare seeds. The amount of $74,600 is appropriated for the foreign seed and plant introduction.

Large appropriations are again made for the prosecution of studies with specific crops. Thus, for cotton $91,000 is provided for an inquiry into ginning, grading, baling, and wrapping practices. This work is extended to include gin compressing and the distribution of the official grades of cotton samples, and the appropriation for testing the waste, tensile strength, and bleaching qualities of the various standard grades of cotton is increased from $10,000 to $60,000. For other fiber plant studies, especially with flax, $20,850 is again allotted, as well as $38,000 for acclimatization and adaptation work with cotton, corn, and other crops introduced from tropical regions. The tobacco studies receive $25,000; the cereal investigations $135,405, of which $40,000 is for corn; the studies of grain handling and grading $76,320; those of drug plants $55,380; and those of sugar beets and the production of table sirup and the means of utilizing cane by-products $41,495. For studies in fruit growing, handling, and marketing $107,500 is available, together with $56,320 for other horticultural work, and $26,690 for the maintenance of the various departmental greenhouses and the Arlington Experimental Farm.

Another large division of the work has to do with plant diseases, $37,000 being available for the maintenance of the general pathological laboratory and the herbarium of plant diseases, $52,675 for fruit diseases, $69,510 for those of forest trees and ornamentals, and $46,000 for cotton and truck crops. For plant physiology and plant breeding there is allotted $44,540, together with $22,280 for the breeding and physiological study of alkali and drought resistant crops. There is also $35,000 for soil bacteriology and plant nutrition studies, $25,000 for biophysics, $24,000 for economic and systematic botany, $28,700 for studying and testing commercial seed, $5,000 for studies of methods of utilizing logged-off lands, and $230,380 for studies of crop production and land utilization under arid and semi-arid conditions.

The Forest Service receives as usual the largest allotment of any Bureau, its aggregate being $5,548,256 as compared with $5,399,679 for the previous year. There are also available the various appropriations under the Appalachian Forest Reserve Act already referred to, certain unexpended balances from the previous year, and an appropriation of $100,000 for fighting and preventing forest fires in cases of extraordinary emergency, this being a reduction from $200,000. The bulk of the appropriation is, of course, to be devoted to the protection and maintenance of the individual National Forests, with $400,000 for the construction and maintenance of improvements, $165,640 for reforestation, $140,000 for studies of wood utilization and preservation, $150,000 for forest fire protection, $25,000 for range studies, $83,728 for silvicultural and dendrological experi-

ments, and $40,160 for miscellaneous forest studies and the dissemination of results. The selection and segregation of lands within National Forests that may be opened to entry under the homestead laws is to be continued under an appropriation of $100,000, with an additional allotment of $85,000 for the survey and listing of those lands chiefly valuable for agriculture.

The appropriations of the Bureau of Chemistry are increased from $1,058,140 to $1,077,581. The allotment for the enforcement of the Food and Drugs Act is $634,301, with $4,280 additional for the study and inspection of American food exports, $50,000 for studies of the handling and marketing of poultry and eggs, $20,000 for similar work with fish, oysters, etc., $10,000 for biological investigations of food and drug products and their constituents, and $52,400 for general investigations. Because of a transfer to the Bureau of Standards of the work of testing miscellaneous supplies purchased on contract for the various Departments of the Government, the appropriation for this purpose is reduced from $40,000 to $14,000.

The various lines of work of the Bureau of Soils and the Bureau of Entomology are continued much as at present, with small increases in a number of items. The Bureau of Soils receives $360,635, an increase of $26,615, of which $11,500 is to extend the inquiry as to possible sources of natural fertilizers, particularly nitrogenous materials. The soil survey work of the Bureau is granted $169,800, with $20,000 additional for the examination and classification of agricultural lands in forest reserves in cooperation with the Forest Service, $15,265 for studies in soil physics, $22,350 for chemical investigations, and $32,700 for soil fertility work. The increase of $87,210 accorded the Bureau of Entomology is divided among its studies of several groups of insects, the largest single item of expenditure being as usual that for the gipsy and brown-tail moth campaign, for which $310,000 is available. The total appropriation of the Bureau is $829,420.

The Bureau of Biological Survey is granted $281,290, an increase of $110,300. This appropriation is to be used principally for administrative and police purposes, $66,000 being allotted for the enforcement of the Lacey and McLean laws for the regulation of imports and interstate movement of game, birds, etc., $21,000 for the maintenance of the various game preserves and transfer of game, and $5,000 for the improvement of an additional preserve in Sullys Hill Park, North Dakota. The appropriations for studies of the food habits of birds and mammals and for other biological investigations, however, are nearly doubled, $15,000 being granted for the destruction of ground squirrels on National Forests, $5,000 for the study of a serious disease of wild ducks in Utah, $95,000 for the destruction of wolves, prairie dogs, and other injurious animals,

the rearing of fur-bearing animals, and similar work, and $26,500 for field studies of the distribution and migrations of water fowl and other birds and of the bird and mammal life of the public domain.

The Bureau of Statistics is rechristened the Bureau of Crop Estimates, the new designation representing more accurately, it is believed, the nature of its work and obviating confusion with results based on actual enumerations such as are made by the Bureau of the Census. Several changes are also made in the language prescribing the work of the Bureau, and the appropriation at its disposal is increased from $243,680 to $275,580. It is expected that these changes will permit of enlarging the scope and completeness of the data collected, notably as regards special crops and industries.

The various activities of the Office of Experiment Stations are continued and several of its functions are considerably extended. The total appropriation is $1,930,780, of which $1,440,000 is paid to the state experiment stations under the Hatch and Adams acts, and $50,500 (a net increase of $10,720) is for general expenses in connection with the enforcement of these acts and the Smith-Lever Act. The work of the Agricultural Education Service and of the Irrigation and Drainage Investigations is continued on the present basis with allotments of $23,000, $106,400, and $96,280 respectively, and $68,840 is granted for statutory salaries.

The total allotment for the insular experiment stations is $120,000, of which the Alaska stations receive $40,000 and those in Hawaii, Porto Rico, and Guam, $35,000, $30,000, and $15,000, respectively. The act provides that of the allotment for the Hawaii Station $5,000 may be used in agricultural extension work, the Territory receiving no funds under the Smith-Lever Act. The annual leave privileges of employees of the Department permanently assigned to Alaska, Hawaii, Porto Rico, and Guam are extended to correspond to those now applying to employees in Washington.

The appropriation for the Nutrition Investigations of the Office is increased from $16,000 to $25,760 and the authority hitherto granted to study means of utilizing agricultural products for food is broadened to include clothing and household equipment. With the enlarged appropriation it is proposed to continue and extend the studies of food with reference to nutritive value and economical use in the home, studying both popular and technical problems, the latter including, among other things, the calorimetric study of changes which take place in fruits and vegetables during ripening and storage. In the case of clothing and household equipment, such questions, considered from the standpoint of the expenditure of human energy, will be studied as the relative durability, economy,

and efficiency of comparable materials and articles for specific purposes, the protective power of clothing of different kinds, the relative value and efficiency of different materials and methods with reference to household labor, the relation of the diet to body efficiency, and similar questions. It is believed that the results of such investigations will be of much interest not only to the housekeeper but also to the general public since they will furnish definite information along lines hitherto very inadequately studied but of great importance in the consideration of questions of rational and economical living. They should also be of direct benefit to the farmer since agricultural production is influenced to a very great extent by the demands of the home.

The salary of the director of the Office of Public Roads is increased from $4,000 to $4,500, and the appropriations as a whole from $279,400 to $352,560. The principal increase is one of $40,000 for studies of road building and maintenance, making $145,000 available for the purpose, special emphasis to be directed to the ordinary sand-clay and dirt roads. Increases of $4,800 are also granted for road management studies, $6,260 for tests of road materials, and $15,000 for field trials of various materials, types of construction, and road equipment.

The work of the remaining branches of the Department is continued substantially as at present. The increasing administrative work is evidenced in the enlarged allotments for the Office of the Secretary, rent, and miscellaneous expenses for which $339,880, $108,329, and $110,000 respectively are available. As a result of recent legislation whereby the administrative auditing of accounts is now carried on in the several Bureaus, the appropriation for the Division of Accounts and Disbursements is reduced from $104,370 to $46,320. The Division of Publications receives $189,500 and the Library $45,360.

In connection with the appropriations included in the Act itself, reference should also be made to the funds derived in other ways. For the fiscal year under discussion, permanent appropriations under the Department aggregate, exclusive of those recently provided by the Smith-Lever Act, $5,999,200, the largest items being those of $3,000,000 for meat inspection and $2,000,000 for the acquisition of lands for the protection of watersheds of navigable streams, and the remainder being almost wholly for forestry purposes. The appropriation act for sundry civil expenses carries an appropriation for the Department printing and binding of $500,000, an increase of $10,000, of which $137,500 is for Farmers' Bulletins and $47,000 for the Weather Bureau.

When it is recalled that large appropriations will also be available for agricultural education in the land-grant colleges under the Mor-

rill and Nelson acts, for the rural education work of the Bureau of Education, demonstration work in agriculture among the Indians, and the payment of the country's quota toward the support of the International Institute of Agriculture, the wide extent to which the principle of federal assistance to agriculture is being carried into practice becomes apparent, and the aggregate expenditure from the Federal funds appears increasingly impressive. As was pointed out by Chairman Lever of the House Committee on Agriculture, however, the entire agricultural appropriation is still inconsequential as compared with the total federal appropriations, the magnitude of the agricultural interests of the country, or even of the annual losses to farm products sustained through insect pests and plant diseases.

Moreover, the conviction is deepening that these appropriations are largely in the nature of a permanent investment for the benefit of the nation as a whole. In the words of Hon. C. G. Edwards of Georgia, "in extending these various benefits and advantages to the farmers we are but doing a simple justice to the sinew and backbone of our great citizenship. In helping the farmers we are helping the whole country, for every class is dependent upon the farmer. . . . We can do nothing that will make for the future welfare of our country more than to aid in this work, which means the establishing of farms and homes. . . . In making appropriations to improve agricultural conditions we are 'casting bread upon the waters,' that will return not only to feed the people of this country, but will means a tremendous increase in our annual farm productions, and will add to the country's wealth, prosperity, happiness, and greatness."

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Simple plant bases and their relation to the synthesis of proteins and lecithins, G. TRIER (*Über einfache Pflanzenbasen und ihre Beziehungen zum Aufbau der Eiweissstoffe und Lecithine. Berlin, 1912, pp. IV+117*).—This practically constitutes a review of the investigations of E. Schulze and his coworkers (abstracted from time to time) and the work of others in this field. Support is given to the Stoklasa theory that the formation of the simplest amino acids of proteins is inseparable from the formation of the components (bausteine) which go to make up the lecithins. The alcohols of the lecithins and the amino acids of the proteins are both deemed a result of Cannizzaro's aldehyde reaction.

The contents of the book include data on the development of alkaloid chemistry; alkaloids and their "bausteine;" the relation between cholin and betain; a new conception of the formation of cholin and betain as well as the simplest components (bausteine) of proteins and lecithins; formation of carbohydrates; Cannizzaro's reaction; the introduction of nitrogen in complexes predestined to become proteins and lecithins; nitrates and ammonium salts; function of phosphoric acid; the synthesis of lecithins; the methylating agent; the position of methyl alcohol and methyl compounds; transformations of glycerol aldehyde; the amino acids—serin derivatives; the formation of methylamin—the formamid hypothesis; the compounds of the C_4-series—asparagin; the compounds of the C_5- and C_6-series—glutamin, pentoses; urea and urea derivatives; cleavage of arginin; the rôle of hydrocyanic acid—Treub's hypothesis; unknown components (bausteine) of proteins; formation of trigonellin; significance of betain; intermediary formation of betain; components (bausteine) of plant and animal phosphatids; the author's studies in regard to the method of preparing lecithins from plant seeds; an explanation of the parallelism between protein and lecithin formation; biological functions of lecithins, etc.

In regard to our knowledge of phytin, M. A. JEGOROW (*Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 14 (1913), No. 4, pp. 229–237*).—The product yielded by Contardi's method for synthesizing phytin always contains inorganic phosphoric acid, and in the most favorable cases only one-half of the original phosphoric acid is present in the organic form when determined by the Schulze-Castoro method. In the experiments it was also shown that the inorganic phosphoric acid, which in the synthetic product exists as free acid, can be easily and completely extracted at room temperature with ether. The only organic phosphoric acid compound obtainable is one containing 22.6 per cent of organically bound phosphorus (P_2O_5 51.76 per cent).

Investigation of the mannit occurring in asparagus juice, E. BUSOLT (*Jour. Landw., 60 (1912), No. 4, pp. 393–396*).—It has been previously pointed out by Tollens and Wichers (E. S. R., 27, p. 502) that asparagus juice does not seem

to contain mannit until after the juice is allowed to stand for a time, when mannit is produced through the agency of organisms or enzyms. In all probability mannit originates in the same manner in string beans.

The findings of Wichers and Tollens were verified by this work, and from the mannit the tri-acetal compound was prepared.

A contribution to our knowledge of the carbohydrates present in vegetables.—II, In regard to the carbohydrates present in the juice of green string beans.—III, The carbohydrates present in cauliflower, E. BUSOLT (*Jour. Landw., 61 (1913), No. 2, pp. 153–160*).—From 10 kg. of green string beans 5,500 cc. of juice was obtained; 3,000 cc. of this juice was kept in a beaker without extra precautions for 8 days, then brought to the boiling point and concentrated to a sirupy consistency. Within 3 months' time a solid mass of crystals was obtained which was identified as mannit, and from the mannit a tri-acet-acetal compound was prepared. This finding is similar to that noted above, and elsewhere. Inositol (Vohl[a]) was not noted. Juice boiled directly after collection and evaporated 8 days later to a sirup did not yield any crystals.

The work with cauliflower was practically a continuation of that reported by Dmochowski and Tollens (E. S. R., 23, p. 415) but with special reference to the presence of glucose in the juice. Under no circumstances could glucose be noted but mannit crystals were obtained instead. The hexanitrates and tribenz-acetal compounds were prepared from the mannit.

The organic nitrogen of Hawaiian soils, W. P. KELLEY and ALICE R. THOMPSON (*Hawaii Sta. Bul. 33 (1914), pp. 22*).—Studies are reported on the chemical nature of the organic nitrogen present in soils, using the acid method of hydrolysis and the following soils belonging to the laterite class common to the Hawaiian Islands: A silty loam taken from old pasture land containing considerable amounts of organic matter and where semiarid conditions prevail; a highly organic sandy soil from land recently cleared of a tropical jungle, and from a district where rainfall is heavy and drainage good; a silty loam used for pineapple culture, but formerly for pasture land, and in a semiarid district; a loam soil containing much gravel and from lands used previously for rice experiments, and which has served for aquatic agriculture for many years; two soils devoted to rice culture for 30 to 40 years, silty in character, and taken from the windward side of the Kanehoe district; a highly humus soil continuously used in rice culture for 30 or more years; and two silty soils devoted to aquatic agriculture, one to rice and the other to taro. So far as known, no nitrogenous fertilizers have been applied to these soils.

The amount of total nitrogen present in the soil, calculated to a dry basis, varied from 0.122 to 1.241 per cent (average 0.463 per cent). The nitrate nitrogen ranged from 0.05 to 1.751 per cent, and the ammoniacal nitrogen from 0.169 to 2.564 per cent of the total nitrogen, showing that these two forms constitute but a small proportion, the greater part being probably in organic form.

Soils representing unaerated conditions, with two exceptions, contained next to no nitrate. "The nitrate found in the remaining unaerated soils was formed almost entirely during the time of drying out in the laboratory."

"Upon boiling different soils with strong hydrochloric acid, the amounts of nitrogen dissolved ranged from 67.51 per cent to 91.88 per cent of the total nitrogen. With two exceptions, the relative percentages of amid nitrogen, split off in the hydrolysis, were approximately the same, amounting on the average to 23.91 per cent of the nitrogen dissolved. Basic nitrogen occurred

[a] Ann. Chem. u. Pharm., 99 (1856), No. 1, pp. 125–128; 101 (1857), No. 1, pp. 50–58.

in the solutions in variable amounts, the average being 9.98 per cent of the soluble nitrogen. The percentages of nonbasic nitrogen, determined by difference, proved to be quite concordant in most of the soils, amounting on the average to 64.57 per cent of the soluble nitrogen."

The amids constitute a much higher percentage of the nitrogen of soils than are said to occur in vegetable proteins. On the other hand, the percentage of basic nitrogen was far less than exists in the majority of vegetable proteins.

The aquatic (anaerobic) soils showed a higher percentage of total nitrogen soluble in hydrochloric acid. On an average 70.69 per cent of total nitrogen was obtained from the aerated soils and 87.93 per cent from unaerated soils. This indicates that a putrefactive process predominates in submerged soils, as previously indicated (E. S. R., 30, p. 420), which leaves the nitrogenous substances more easily soluble in hydrochloric acid. "The amount of nitrogen soluble in 1 per cent hydrochloric acid was about twice as large as that of ammonia originally occurring in the soils. The solubility in 3 per cent sodium hydrate varied from 49.56 per cent to 76.62 per cent of the total nitrogen. Of the nitrogen thus dissolved, 57.85 per cent was precipitated by dilute hydrochloric acid, of which 11.93 per cent (expressed in percentage of the humus nitrogen) remained insoluble after boiling in strong hydrochloric acid for 10 hours. Amids comprised 28.77 per cent of the humus nitrogen, of which about one-half existed as amid in the original humus solutions, and which remained in solution upon acidifying with hydrochloric acid. The remaining half was split off when the humus, precipitated by hydrochloric acid, was subjected to acid hydrolysis. The basic nitrogen ranged from 4.39 per cent to 44.83 per cent of the humus nitrogen, increasing as the total nitrogen of the humus decreased. Nonbasic nitrogen was found to constitute 53.38 per cent of the humus nitrogen, of which 25.05 per cent existed as such in the original humus solutions.

"The amounts of amid and basic nitrogen in humus expressed as percentages of the humus nitrogen were found to be higher than the amounts obtained by subjecting the original soil to hydrolysis. In view of the large amounts of amid occurring in humus solutions, it was found better to use sodium hydrate as the solvent for extracting humus that is to be used for total humus nitrogen determinations. The humus of Hawaiian soils contains a small percentage of nitrogen (5.88 per cent as an average of 22 samples), in which respect the humus of these soils closely resembles that found in humid soils in the States."

See also previous notes by others (E. S. R., 25, pp. 622, 623; 26, pp. 320, 615, 616; 28, p. 813).

Some organic constituents of the culture solution and the mycelium of molds from soil, M. X. SULLIVAN (*Abs. in Science, n. ser., 38 (1913), No. 984, p. 678*).—An examination was made of the dried mycelium of mixed mold cultures from soil and of *Penicillium glaucum* grown on Raulin's solution and of the filtered solution after mold growth for organic constituents.

"In the mixed molds was found a large number of organic substances, many of which were subsequently found in *P. glaucum*. In the alcoholic soda extract of *P. glaucum* were found oleic and palmitic acids, a fatty acid melting at 54° C., a fatty acid which appears to be elaidic acid, hypoxanthin, guanin and adenin, histidin, thymin, and chlorin. In the direct alcohol extract was found mannit, cholesterol bodies, hypoxanthin, and cerebrosids. From mold grown on Raulin's solution plus peptone a small amount of guanidin was found. In the culture solution after a number of weeks' growth were found fatty acids, purin bases, a small quantity of a histidin-like body, pentose sugar, unidentified aldehydes, etc. Many of these compounds have been found in soil

and the conclusion is drawn that micro-organisms, such as yeasts, bacteria, and molds, play an important part in their formation."

Polyatomic alcohols as sources of carbon for lower fungi. R. E. NEIDIG (*Jour. Biol. Chem., 16 (1913), No. 1, pp. 143–145; abs. in Science, n. ser., 38 (1913), No. 984, p. 675*).—The alcohols used as regards their utilization by 4 genera and 8 species of molds were methyl alcohol, glycol, glycerol, erythrite, adonite, mannit, dulcite, and sorbite. The molds were cultivated in media containing these alcohols.

"It was found that methyl alcohol produced no growth, glycol induced germination only, glycerol produced strong cultures, erythrite could be used by the majority of molds and adonite by only a few, while all three of the hexatomic alcohols may be regarded as good sources of carbon. These results indicate that molds are able to use both optically active and inactive compounds as sources of carbon. If viewed from the standpoint of their oxidation products it is possible that active compounds are first formed and these are then utilized in the development of the molds."

Influence of certain organic substances upon the secretion of diastase by various fungi. CHRISTINE CHAPMAN and W. C. ETHERIDGE (*Abs. in Science, n. ser., 38 (1913), No. 984, p. 675*).—The influence of varying concentrations of cane sugar, glucose, peptone, and tannic acid upon the secretion of diastase by *Aspergillus niger, A. oryzæ, Penicillium expansum, P. camemberti, Mucor rouxii, and Cephalothecium roseum* was investigated. Czapek's solution was employed with the sugar replaced by 0.4 per cent soluble starch.

In general it was found that the presence of any of these organic substances retarded the action of diastase by the fungi, and the higher the concentration the greater the retardation.

Effect of acids upon the catalase of taka-diastase. R. E. NEIDIG (*Abs. in Science, n. ser., 38 (1913), No. 984, p. 675*).—Data are given showing the inhibitory effects of several of the important inorganic and organic acids toward the catalase of taka-diastase.

"Curves were platted for different acid concentrations which show the quantity of oxygen liberated at stated intervals. The acids, arranged in order of the magnitude of their inhibiting effect for equi-normal solutions, are as follows: Sulphuric, hydrochloric, oxalic, tartaric, citric, and acetic. The inhibiting effect of the first three was much more pronounced than that of the others. Neutralization of the acid solution usually restored some of the activity, the amount of increase depending upon the particular acid used. Van Slyke's amino-nitrogen apparatus was used in these experiments for measuring the amount of oxygen liberated."

About the presence of stachyose in beans and other legumes. G. TANRET (*Bul. Soc. Chim. France, 4. ser., 13 (1913), No. 4, pp. 176–182; abs. in Chem. Ztg., 37 (1913), No. 33, p. 334*).—Stachyose, when boiled with strontium oxid, forms an insoluble compound from which sugar can easily be obtained. This reaction was tried with various legumes and in all cases, with the exception of peas, crystallized stachyose could be obtained, although it was always mixed or combined with crystallized saccharose. According to this stachyose forms a portion of the coloring material in foodstuffs.

The juice of Ficus coronata, an incomplete vegetable pancreatic juice without amylase but with a predominating proteolytic enzym.—A comparison with F. carica. C. GERBER (*Compt. Rend. Acad. Sci. [Paris], 156 (1913), No. 25, pp. 1917–1919*).—The latex of *F. coronata* is conspicuous for its absence of caoutchouc. When it leaves the tree it is without color and on standing it rapidly turns reddish brown but remains transparent. It contains an amylase and in this respect it resembles *Morus alba*. The lipolytic power of the latex

is twice as strong as that of *F. carica*. It is much more thermostable than the enzym of the latter. The proteolytic enzym (?), measured according to its coagulating power on milk, is four times as strong as that present in *F. carica* and also more thermostable. It coagulates at all temperatures and coagulates boiled milk much better than raw milk. The enzym causing the caseation is very sensitive toward boric acid and the chlorids of cadmium and copper

The decomposition of amygdalin and vicianin by enzym action, A. COMPTON (*Chem. News, 106 (1912), No. 2758, pp. 163–165; abs. in Chem. Ztg., 37 (1913), No. 28, p. 281*).—If the biose in the amygdalin molecule is called amygdalose, the decomposition of amygdalin proceeds as follows:

$$C_{20}H_{27}O_{11}N \xrightarrow[\text{(Yeast, Almond emulsin)}]{\text{Amygdalase}} \begin{cases} C_6H_{12}O_6 \\ C_{14}H_{17}O_6N \end{cases} \xrightarrow[\text{(Almond emulsin)}]{\text{Amygdalinase}} \begin{cases} HCN \\ C_6H_5CHO \\ C_6H_{12}O_6 \end{cases} \quad \text{(A)}$$

Vicianin is also converted into hydrocyanic acid, benzaldehyde, and the biose vicianose if the glucosid is treated with an extract of *Vicia augustifolia*. If, however, almond emulsin is used, the simple sugars arabinose and glucose result:

$$C_{19}H_{25}O_{11}N \xrightarrow[\text{(Vetch, Almond emulsin)}]{\text{Vicianose}} \begin{cases} HCN \\ C_6H_5CHO \\ C_{11}H_{20}O \end{cases} \xrightarrow[\text{(Almond emulsin)}]{\text{Vicianase}} \begin{cases} C_5H_{10}O_5 \\ \\ C_6H_{12}O_6 \end{cases} \quad \text{(B)}$$

As marked differences are shown in the above, the question is asked why the decomposition does not proceed according to the following scheme:

$$C_{20}H_{27}O_{11}N \xrightarrow{\text{Amygdalinase}} \begin{cases} HCN \\ C_6H_5CHO \\ C_{12}H_{22}O_{11}\,(?) \end{cases} \xrightarrow{\text{Amygdalase}} \begin{cases} C_6H_{12}O_6 \\ \\ C_6H_{12}O_6 \end{cases} \quad \text{(C)}$$

If it were possible to prepare an amygdalase free from amygdalinase, it is believed some new light would be thrown upon the above processes. In all probability the reactions occurring with the complex enzyms are dependent upon the amount of amygdalase and amygdalinase present in the mixture. If amygdalinase is present in the larger quantity, the reaction proceeds according to formula (C), but if amygdalase is in excess, the reaction according to formula (A) probably takes place.

The decomposition of cellulose by micro-organisms, A. KRAINSKY (*Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 14 (1913), No. 4, pp. 255–261, figs. 7*).—For noting the cellulose-decomposing capacity of organisms a square or round piece of filter paper was used in Erlenmeyer flasks containing a mineral nutrient solution. The filter paper was so placed that a portion of it dipped into the nutrient medium and also touched the wall of the flask. The surface of the filter paper in these experiments was infected with an infusion of the soil obtained from a botanical garden, and the flasks with their contents were incubated at 30° C. At this temperature the filter paper became covered with fungi and the black and reddish cultures were particularly capable of producing pockets in the filter paper.

Two especially good cellulose-decomposing Actinomyces species were isolated in pure cultures. One of the cultures (*Actinomyces melanocyclus*) capable of producing black rings was found to be identical with *Micrococcus melanocyclus*, which has been described by Maerker, and produces red colonies on paper which soon become covered with black aerial spores. On glucose-agar

round colonies are formed which also will form black spores. The second culture, *A. albo-roseus*, on filter paper forms white, chalklike flakes, but later red pigment is produced which colors both the filter paper and the nutrient solution. On ammonium sulphate dextrose agar and on bouillon dextrose agar white aerial spores are produced, but on bouillon agar no aerial spores are obtained. The aerial spores of *A. melanocyclus* resemble cocci while those of *A. albo-roseus* are oval or bacilli-like. Although both of the organisms decompose cellulose, *A. melanocyclus* is stronger in this respect. Reducing sugars were not found in the culture medium.

A new and simple titrimetric method for determining thiosulphate in the presence of sulphites, J. Bodnár (*Kisérlet. Közlem., 16 (1913), No. 4, pp. 554–561*).—The method, which is used for lime-sulphur wash, depends upon the fact that silver thiosulphate will become decomposed by the interaction of water and sulphuric acid results. By simply titrating the sulphur content, the amount of thiosulphate taking part in the reaction can be estimated. The method can also be used for determining the titer of a sodium thiosulphate solution even though large amounts of sulphites are present.

By the iodometric method sulphites can be estimated when thiosulphates are present, providing the amount of thiosulphate is known. This can easily be determined by the author's method. The method has the advantage over Gutmann's method in so far that the presence of chlorids does not interfere with the results.

The detection and approximate determination of traces of thiosulphate in sulphites, J. Bodnár (*Kisérlet. Közlem., 16 (1913), No. 4, pp. 562–566*).—If silver nitrate is added to a sulphite solution (sodium sulphite), silver sulphite is deposited, which when exposed to the air will retain its color for a long time. Silver thiosulphate, on the other hand, loses its whiteness rapidly and turns lemon yellow, orange yellow, dark brown, and finally black. Consequently if silver nitrate is added to a sulphite solution which contains thiosulphate, a white precipitate is not obtained, but according to the amount of thiosulphate present a light yellow up to a black precipitate results.

The above reaction will detect as little as 0.3 cc. of fiftieth-normal sodium thiosulphate in 5 cc. of a 10 per cent sodium sulphite solution, corresponding to 0.09 per cent of sodium thiosulphate. As the intensity of the color is proportional to the amount of thiosulphate present, the method may serve as an approximate one for estimating the amount of thiosulphate in sodium sulphite.

The reactions of Reynold, Koninck, Musset, Arnold, and Gutmann were found less sensitive than the one proposed above.

Estimating the fineness and the chemical examination of flowers of sulphur and ground sulphur used for combating plant diseases, T. S. Hofman (*Verslag. Landbouwk. Onderzoek. Rijkslandbouwproefstat. [Netherlands], No. 14 (1913), pp. 1–8*).—In Holland sulphur is used chiefly for dusting vines and rose plants for combating mildew diseases. The fineness of sulphur determines to quite an extent its adhesive power, and for estimating the fineness a modification of Chancel's method is employed. According to the original method 5 gm. of sulphur is shaken with ether in a calibrated tube termed a "sulphurimeter," which is described in detail. The finer the sample of sulphur, the greater is the space which it occupies.

In order to reduce the error in these experimental tests 40 instead of 5 gm. of sulphur was taken, and instead of ether alcohol was used. The results obtained by Chancel's method and the modified method are reported.

For judging sulphur the following should be noted: (1) the color and the appearance; (2) the texture as noted by the tips of the fingers; (3) the appearance under the microscope; (4) the solubility in carbon bisulphid; (5) its

reaction; and (6) the content of arsenic, ash, moisture, and impurities or adulterations.

The estimation of small quantities of manganese and chromium in minerals and rocks, M. DITTRICH (*Ztschr. Anorgan. Chem., 80 (1913), No. 2, pp. 171–173; abs. in Jour. Chem. Soc. [London], 104 (1913), No. 606, II, pp. 344, 345*).—It is pointed out that the colorimetric method for manganese is often difficult to use because of the presence of chromium which changes the color of the solution. If, however, ammonia is added to the mixed solution of permanganate and chromate and the solution is warmed, all of the manganese and iron are precipitated in the hydroxid form. The washed precipitate can then be dissolved and oxidized and the manganese estimated with ammonium persulphate in the usual manner. The chromium can be determined colorimetrically by comparing it with a standard solution of potassium chromate after the removal of silver by sodium chlorid and concentrating. The method is not entirely accurate.

Drying in an electrically heated vacuum desiccator for determining the hygroscopicity of soils, R. HORNBERGER (*Landw. Vers. Stat., 82 (1913), No. 3–4, pp. 303–307*).—Certain defects are present in the Mitscherlich desiccating apparatus. In this article the author relates his experiences with the apparatus and suggests various contrivances for overcoming the difficulties.

The determination of phosphoric acid in the soil, R. HORNBERGER (*Landw. Vers. Stat., 82 (1913), No. 3–4, pp. 299–302*).—During the course of analyses of the hydrochloric extract of forest soils (red sandstone) a small part of the phosphomolybdate precipitate did not dissolve in ammonium hydroxid despite the fact that thorough washing was done. This material remained on the filter as a small white residue. The ammoniacal solution of the phosphomolybdate was not clear after filtration and after a few days clarification set in with a deposit of some whitish flakes. The deposit was found to consist of titanium. Test. were then made with artificial mixtures to determine how this disturbing factor could be removed. It is shown that when molybdic acid solution and ammonium nitrate are added to a nitric acid solution of the phosphate, some titanium is precipitated which remains insoluble when the phosphomolybdate is treated with ammonium hydroxid. A portion of this, which is present in a fine state, passes through the filter into the filtrate.

The titanium in the filtrate can be removed after allowing the solution to stand for a time but it is advisable to add to the wash water some ammonium chlorid in order to prevent the titanium from passing through the filter. The total elimination of titanium was not possible, but the least contamination of the ammonium phosphomolybdate precipitate takes place when the molybdate solution is in excess and no hydrochloric acid is present; under these conditions the percentage of phosphorus in the titanium precipitate is also the smallest. Both of these errors can be prevented if the titanium residue from the filtrate is fused with soda and the melt is extracted with water. The phosphorus goes into solution, the titanium remains behind, and after driving out the carbon dioxid the phosphoric acid can be determined in the usual manner.

Citrate-soluble phosphoric acid in some crude phosphates, M. A. STABODUBOWA and I. V. JAKUSCHKIN (*Izv. Moskov. Selsk. Khoz. Inst. (Ann. Inst. Agron. Moscou), 19 (1913), No. 2, pp. 377–395*).—This investigation shows that crude phosphates of all kinds can be decomposed with acetic acid. It was furthermore noted that Wagner's reagent also attacks the most internal nucleus of all raw phosphates and consequently is of no value for judging adulterations in Thomas slag powders. Petermann's reagent can not be used, especially at low temperatures, for decomposing crude phosphates which are

unavailable for the Gramineæ, but when applied to phosphates which are capable of furnishing their phosphoric acid to the Gramineæ the reagent extracts a considerable amount of phosphoric acid.

Ordinary phosphorites show only traces of phosphoric acid with this method, and the phosphorites from Singilei yield about 4 per cent of citrate-soluble phosphoric acid, which is about one-fourth of all the phosphoric acid present in this fertilizer. Iron and aluminum phosphates are easily soluble in Petermann's reagent while calcium phosphate is almost insoluble.

The alundum crucible for the determination of phosphoric acid, G. Liberi (*Ann. R. Staz. Chim. Agr. Sper. Roma, 2. ser., 6 (1913), No. 2, pp. 247–255*).—It is concluded that the alundum crucible will be of service for the determination of phosphoric anhydrid as magnesium pyrophosphate. It is necessary, however, to remove the impurities which are present in the crucible by washing with hydrochloric acid in order to obtain a comparatively constant weight.

In regard to fertilizer analysis, E. A. Mitscherlich and W. Simmermacher (*Zentbl. Kunstdünger Indus., 18 (1913), No. 20, pp. 430, 431*).—In a previous communication one of the authors has pointed out that the methods for judging a fertilizer and a soil should be founded on the same principles. This is especially true because a fertilizer is only assimilable when it becomes a part of the soil. As fertilizers when in the soil undergo a certain amount of change, analyses lose some of their significance. The results obtained with fertilizers in sand cultures, however, give figures which are of physiological and commercial value.

The purpose of this work is to bring together or connect the figures obtained for the solubility of fertilizers and those obtained in vegetative experiments as a result of using fertilizer. The logarithmic formula of the law of minimum is theoretically discussed and its validity is demonstrated from a practical standpoint. The principles for a new method of chemical fertilizer analysis, which depends upon the determination of the nutrient materials in the fertilizer and the estimation of the saturation concentration of the nutrients in water saturated with carbon dioxid at 15° C. are explained. The relation between the plant physiological and chemical fertilizer analysis is shown.

The determination of cellulose with nitric acid, V. Rao and B. Tollens (In *Festschrift zum siebzigsten Geburtstage von Jacob Esser. Berlin, 1913, pp. 49–56*).—The methods compared in this study were the Cross and Bevan, Dmochowski and Tollens (E. S. R., 23, p. 417), and J. König and the materials used were pure cellulose in the form of absorbent cotton, Swedish filter paper, common filter paper treated by Henneberg's method with 1.25 per cent sulphuric acid and 1.25 per cent potassium hydroxid, sulphate cellulose, sodium hydrate cellulose, crude wood fiber, jute, cacao shells, rice straw, wheat straw, rye flour, oat flour, ground American white corn, buckwheat, cotton-seed meal, marrow from *Aralia papyrifera* (which is used in China and Japan for making paper), and cacao beans. With the cacao beans it was first necessary to remove the fat when either the Cross and Bevan or the Dmochowski and Tollens method was used.

The Cross and Bevan method uniformly gave the highest results with all materials except the marrow of *A. papyrifera*, and these were not always similar to those obtained by multiplying the results obtained by the Dmochowski and Tollens method by 1.1. In some cases the factor was less than 1.1 and in others more. For jute and cereal straws it ranged from 1.16 to 1.38. Nitric acid in some cases attacks the cellulose more than chlorin, which is used in the Cross and Bevan method, but its employment is preferable since chlorin affects the health of the laboratory workers. It is first necessary, however, to establish the correct conversion factors.

Estimation of sugar in food products (honeys, comfits, jellies, marmalades, sirups, etc.), C. F. MUTTELET (*Ann. Falsif., 6 (1913), No. 53, pp. 138–143*).—Constants for the following sugars were used in this work: Saccharose $[a]_D^{20}+66.5$, glucose +53, levulose −93.5, and invert sugar −20.25.

The product under examination is made into a solution (*A*) which contains from 5 to 10 gm. of saccharin matter free from other reducing substances in 100 cc. Ten cc. of this is made up to 100 cc. (solution *B*) and used for the determination of the copper-reducing power, and the result for 100 cc. of solution *A* is expressed as *p* grams. The reduction after inversion is also determined and this for 100 cc. of solution *A* is expressed as *q*.

The rotation of the solution *A* is taken at 20° C. in a 200-mm. tube and the rotation designated as *D*. The amount of saccharose (*S*) present $=0.95\ (q-p)$ gm., which corresponds to a deviation of *c*, *c* being equal to $1.33\times S$. The sum of the weight of the glucose (*G*) and levulose (*L*) $=G+L=p$, which corresponds to a rotation of $d=D-c$. The results obtained are multiplied by 10 if 10 gm. of substance is used to make the solution *A*. All of the above rotations are in circular degrees.

Detection of technical invert sugar with β-naphthol, F. M. LITTERSCHEID (*Chem. Ztg., 37 (1913), No. 32, p. 321*).—This reaction, like Fiehe's, depends upon the formation of a coloring matter. It is conducted as follows:

From 10 to 20 gm. of the honey, or other substance supposed to contain invert sugar, is rubbed up three or four times with 10 cc. of ether and the ethereal extracts filtered into a shallow porcelain dish. A small crystal of β-naphthol is dissolved in the ethereal filtrate and the dish set aside to allow a spontaneous evaporation of the ether. To the residue which remains is added from 4 to 5 cc. of an 88 to 90 per cent solution of pure sulphuric acid and observation made at intervals of the color changes which take place in the dish during a period of one-half hour. Honeys containing no technical invert sugar give a dirty yellow coloration which within one-half hour is yellowish green with a reddish hue. In a positive reaction the color is a Bordeaux to a violet red, its intensity depending upon the amount of invert sugar present.

In many cases the reaction can also be obtained by simply rubbing up the honey twice with ether containing one or two crystals of β-naphthol, decanting off the supernatant fluid into a porcelain dish, allowing it to evaporate, and adding sulphuric acid as described above.

This work will be reported upon later in more detail.

About honey examination, G. BUCHNER (*Ztschr. Öffentl. Chem., 19 (1913), No. 7, pp. 132, 133*).—A so-called flower honey (Blütenhonig) apparently containing no glucose gave the Lund and Ley reaction, making it appear as though invert sugar was present, but was found on microscopical examination to contain crystals of calcium oxalate.

Determination of sugar in bagasse, H. PELLET (*Bul. Assoc. Chim. Sucr. et Distill., 30 (1913), No. 6, pp. 305–312; abs. in Chem. Ztg., 37 (1913), No. 14, Repert., p. 66*).—The samples taken hourly are mixed together and minced in a mechanically driven chopping machine. The comminuted material is then extracted with hot water in a Zamaron-Norris apparatus which was modified by the author in order to allow it to be hermetically sealed. Sugar cane can also be extracted with the apparatus. The water in the bagasse may be determined by drying 50 gm. at 110° C. in an electric oven.

Hot and cold digestion in beet analysis, H. PELLET (*Bul. Assoc. Chim. Sucr. et Distill., 30 (1913), No. 6, pp. 328–334; abs. in Chem. Ztg., 37 (1913), No. 14, Repert., p. 66*).—In view of Chapelle's statements (E. S. R., 28, p. 413), some further tests were made with the hot and cold digestion methods. The results for sugar in both instances were alike.

Further notes on the relationship between the weight of the sugar beet and the composition of its juice. J. A. HARRIS and R. A. GORTNER (*Biochem. Bul., 2 (1913), No. 8, pp. 524–529, pl. 1*).—A critical analysis of Novotný's results and those of Andrlík et al. (E. S. R., 27, p. 642; 30, p. 536).

The authors conclude that the notes presented by Andrlík, Bartoš, and Urban "form a very slender basis for the conclusion (widely circulated by uncritical reviewers) that in beets of the same strain there is no negative correlation between weight and sugar content. Nevertheless one must recognize the possibility of the correctness of the conclusion. Should it prove to be valid, the suggestion follows that the negative correlation demonstrated in commercial cultures has a genetic origin, i. e., that strains characterized by large root size are also characterized by low sugar content, and that when these strains are intermingled and intercrossed in field cultures there results a negative correlation between the weight of the individual beet and the sugar content of its juice. Such a result would be of the greatest interest to breeders."

Report of the department of chemistry, C. A. JACOBSON and M. ADAMS (*Nevada Sta. Rpt. 1913, pp. 47–50*).—This details the work in progress and completed (E. S. R., 25, p. 810; 26, p. 802; 27, p. 713; 28, pp. 608, 710; 29, p. 111).

In some experiments on wood distillation the products resulting from 4 woods were studied. "From a sample of 'fat' yellow pine a clear water-white sample of light oil, boiling at between 158 and 178°, and possessing many of the properties of the spirits of turpentine, has been obtained. This oil is now being examined to determine its chemical identity. Calculated from the results so far obtained, one cord of 'fat' yellow pine should yield 26 gal. of this turpentine-like oil. Besides this light oil, there have been obtained from the same wood, acetic acid, methyl alcohol, creosote, wood tar, and charcoal of commercial value. A sample of green yellow pine was also distilled and a sample of the above-mentioned light oil was obtained, but the yield was small, amounting to only about 5 gal. per cord. Samples of sagebrush and *Pinus monophylla* have also been distilled, but the assay of the distillate has not yet been completed."

METEOROLOGY—WATER.

Weather science, R. G. K. LEMPFERT (*London, Edinburgh, and New York, [1912], pp. 94, figs. 16*).—This brief treatise describes and discusses the observations of an individual station and the processes underlying weather changes, and shows how the observations at different places are combined in the study of the weather and in forecasting.

Weather forecasting, R. M. DEELEY (*Nature [London], 93 (1914), No. 2316, pp. 58, 59*).—A plea is made for better daily weather charts as a means of utilizing the great mass of data now "practically buried so far as the individual meteorologist is concerned."

The agricultural meteorological service in Germany, R. BÖRNSTEIN (*Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1913), No. 11, pp. 1667–1672*).—A brief description of this service is given. It is stated that the whole country is divided into meteorological service districts, each with its station and in some cases with substations. The most important duty of the service is the timely and prompt distribution of daily weather charts.

"In order to keep the whole meteorological service in close touch with practical agriculture, in most districts reliable collaborators (*Vertrauensmänner*) have been appointed. These are practical farmers, teachers of agriculture, and the like, at least one in each district, who constantly devote their atten-

tion to the meteorological service; they express their opinion on the weather forecast and follow all the details of the work. Their criticism of the forecast is expressed in figures and sent every week on post cards to the heads of the service. The value of these 'percentages of hits' is not very great, [and they] are not published; nevertheless, they often give the directors of the service useful hints and have thus, in spite of many objections, been kept up. Further, the Vertrauensmänner transmit to the directors many of the wishes and proposals arising from the daily practice of farming, and in this manner many valuable improvements have been made in the meteorological service."

The need of educating farmers to a better understanding and use of the weather charts is emphasized. "Lectures and discussions in meetings of associations, especially agricultural and educational, as well as special courses for teachers and the inclusion of meteorology in the curriculum of seminaries and universities, provide both for making grown-up people acquainted with the principles of meteorology and for introducing this branch of science into the schools."

Present organization of agricultural meteorolgy in Sweden, H. E. HAMBERG (*Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 1, pp. 6–8*).—The meteorological service of Sweden is centralized in the State Meteorological Institute at Stockholm. There is no special service for agricultural meteorology, but an effort is made to collect data and to issue storm warnings and forecasts and publications of interest to agriculture. The *Swedish Monthly Meteorological Bulletin in the Interests of Agriculture* has been issued for over 30 years. "Each number contains a chart showing the quantity of rainfall, and a certain number of tables on the temperatures of the air and the soil, and the winds, besides communications from observers, etc." Special provision is made for observations in the interest of agriculture on storms, frosts, and ice, as well as for phenological observations.

A short list of references to articles bearing on the subject is given.

About climatical variations, H. ARCTOWSKI (*Amer. Jour. Sci., 4. ser., 37 (1914), No. 220, pp. 305–315, figs. 3*).—Various causes which produce climatic changes are discussed, the more important conclusions reached being "that more or less periodical changes of the solar constant must be the real primary cause of the various climatic variations. . . . Differences of 0.15 to 0.20 have been observed every year. Such differences, if permanent during some centuries or thousands of years, would produce the required differences of temperature."

The thermal state of the atmosphere, A. BOUTARIC (*Compt. Rend. Acad. Sci. [Paris], 158 (1914), No. 9, pp. 652–656*).—Methods of mathematical physics are applied in this article to the solution of the question of the causes of the fall in temperature of the atmosphere with elevation.

Measurements of the emanations content of soil air, K. KÄHLER (*Phys. Ztschr., 15 (1914), No. 1, pp. 27–31*).—Measurements by means of the Benndorf electrometer are recorded.

It was found that changes in atmospheric pressure exerted a great influence upon the amount of the radio-active emanations of the soil and also upon the escape of the emanations from the soil into the air. Sunshine favored the escape of the emanations but its action was masked by other factors.

A determination of the variation with altitude of the radium emanation content of the atmosphere, J. R. WRIGHT and O. F. SMITH (*Phys. Ztschr., 15 (1914), No. 1, pp. 31–39*).—The amount of radium emanations in the air at Manila at a height of 5 meters above the sea and on Mt. Pauai, 2,460 meters above sea level, was determined by the method of absorption in coconut charcoal.

The average of emanations per cubic meter of air was equivalent to 82.48×10^{-12} gm. for Manila, and 19.18×10^{-12} gm. for Mt. Pauai, the average ratio between the two being 4:1. The amount of emanations in the air varied at a given place within comparatively wide limits in dependence upon the meteorological conditions. With rainy weather and high winds the amount was very low, while with fine weather and low winds the amount was comparatively high. The content was much higher at night than during the day.

The climate and weather of San Diego, California, F. A. CARPENTER (*San Diego, 1913, pp. XII+118, pls. 13, figs. 15*).—This treatise, setting forth fully the characteristic as well as the unusual features of the weather and climate of San Diego, is based upon a continuous official meteorological record since 1849 and upon noninstrumental observations dating back to 1542.

Climate and meteorology of New Zealand, D. C. BATES (*New Zeal. Off. Yearbook 1913, pp. 34–50, pls. 5, fig. 1*).—Observations on temperature, pressure, rainfall, sunshine, wind, etc., during 1912 are summarized and discussed, and comparisons are made with the meteorological conditions of previous years. The generally favorable climatic conditions of the country are emphasized, and it is shown that these conditions are unusually conducive to health and agricultural productiveness.

The leading feature of the climate is the abundance and frequency of the rainfall and its comparatively uniform distribution. Sunshine and rain alternate fairly well throughout the year, with much greater predominance of the former. The rainfall is usually more intense and frequent during the night than during the day.

Monthly and annual rainfall from 1837 to 1912, inclusive, at St. Paul, Minnesota (*Ann. Rpt. Bd. Water Comrs. St. Paul, Minn., 13 (1912), pp. 116, 117, pl. 1; Engin. News, 70 (1913), No. 11, pp. 514, 515, figs. 2*).—The rainfall record for 1837–1911 is shown in tables and diagrams in the first report cited; the data for 1912 are added in the second article referred to. The highest annual rainfall recorded was 49.69 in. in 1849; the lowest, 10.21 in., in 1910. The mean annual rainfall for the whole period was 27.41 in.

Composition of rain water collected in the Hebrides and in Iceland, N. H. J. MILLER (*Jour. Scot. Met. Soc., 3. ser., 16, No. 30, pp. 141–158; abs. in Jour. Chem. Soc. [London], 106 (1914), No. 615, I, p. 128; Rothamsted Expt. Sta., Harpenden Ann. Rpt. 1913, pp. 20, 21*).—Determinations of ammonia and nitrate nitrogen and chlorin in samples of rain water collected at Vifilsstadir, Iceland, and at Butt of Lewis and other places in the Hebrides and on the west coast of Scotland are reported.

The results for ammonia and nitrate nitrogen were very low, the annual rainfall of 39.7 in. at Butt of Lewis containing only 0.034 parts of nitrogen as ammonia and 0.032 parts of nitrogen as nitrates per million; that of Vifilsstadir 0.091 and 0.03 parts, respectively. The total nitrogen per acre brought down by the rainfall was 0.6 lb. at Butt of Lewis and 1.065 lbs. at Vifilsstadir. The amounts at other places were somewhat higher (1.8 to 2.2 lbs.) but only about half the amount found in rain water at Rothamsted.

The chlorin content of the rain water varied from 7.8 parts per million per month, equivalent to 52.2 lbs. per acre annually at Vifilsstadir, to 749.9 parts per million, equivalent to 6,884 lbs. per acre at Butt of Lewis, and 759.6 parts per million, equivalent to 5,753 lbs. per acre, at Barrahead.

The economic value of tropical rainfall, G. CAPUS (*Ann. Géogr., 23 (1914), No. 128, pp. 109–126, figs. 4*).—Determinations of the nitrogen content of the rainfall at Hanoi, Tonkin, from April, 1902, to September, 1909, are reported and discussed.

The average annual rainfall during this period was 1.65 meters (5.4 ft.). The evaporation was approximately one-half of the rainfall. The average amount of nitric nitrogen brought down annually by the rain was 43.35 lbs. per acre, of ammoniacal nitrogen 11.58 lbs. These are much larger amounts than are found in the rainfall of temperate regions and sufficiently large to be of considerable economic importance from the fertilizing standpoint.

The genesis of dew, W. GODDEN (*Symons' Met. Mag., 48 (1913), No. 573, p. 163*).—Observations on grass lands are briefly reported from which the general conclusion is drawn that about 69 per cent of a given dew deposit is exhaled by the grass, about 25 per cent is precipitated from the atmosphere, and the rest is derived from the soil.

A sliding rule for the determination of the dew point, absolute and relative humidity, as well as saturation deficiency, A. KORFF-PETERSEN (*Ztschr. Hyg. u. Infektionskrank., 77 (1914), No. 1, pp. 177–183, fig. 1*).—The rule and its method of use are described.

Combating hail (*Bul. Soc. Nat. Agr. France, 74 (1914), No. 2, pp. 130–144, 218–238*).—An account is given of a discussion of this subject by a number of different persons, in which particular emphasis is laid upon the relation of forests to hailstorms and the possibility of reducing damage from this source by extension of the forest area.

Electrical protection against hail in Gironde, F. COURTY (*Vie Agr. et Rurale, 3 (1914), No. 12, pp. 313–316, figs. 3*).—Positive and negative results obtained with "electric niagaras" and similar devices are reviewed without definite conclusions as to their efficacy.

Surface water supply of St. Lawrence River Basin, 1912, C. C. COVERT, A. H. HORTON, and W. G. HOYT (*U. S. Geol. Survey, Water-Supply Paper 324 (1914), pp. 149, pls. 3*).—This report presents results of measurements of flow made on streams tributary to Lakes Superior, Michigan, Huron, Erie, and Ontario, and to the St. Lawrence River.

A summary of mean discharge per square mile shows the almost entire lack of uniformity or agreement between any two streams, "which indicates that the discharge of each stream is a law unto itself, and that all projects dependent upon stream flow, if they are to be developed along the safest and most economical lines, must be based on records of stream flow collected with great care over a long series of years as near the location of the project under consideration as possible."

SOILS—FERTILIZERS.

The characterizing of soil according to the molecular composition of the silicates soluble in hydrochloric acid (zeolitic silicates), R. GANS (*Internat. Mitt. Bodenk., 3 (1913), No. 6, pp. 529–571*).—The author summarizes the results of investigations by himself and others as follows:

The zeolitic silicates show the same general composition and behavior as the artificial aluminum silicates and may like them be considered as chemical compounds. As a result of weathering they do not always occur in the soil in pure form but are frequently mixed with decomposition products. They show the characteristic aluminum silicate molecular composition 3+Mols. SiO_2: 1 Mol. Al_2O_3: 1 Mol. base when protected from weathering by the carbonates of the alkaline earths, i. e., in neutral or alkaline soils. They show a less base content than 1 Mol. base: 1 Mol. Al_2O_3 when decomposed by acid (carbon dioxid) weathering solutions. The proportions of SiO_2 to Al_2O_3 remains 3+: 1 under such conditions, i. e., in acid soils. They show a less silica content than 3 Mol. SiO_2: 1 Mol. Al_2O_3 when decomposed by alkaline weathering solutions which

dissolve out a part of the silica. On this account, i. e., in neutral or alkaline soils, they are unable to combine 1 Mol. of base with 1 Mol. Al_2O_3. This shows that the neutral, alkaline, or acid nature of the soil is indicated not by the percentage by weight of the bases extracted by boiling concentrated hydrochloric acid, but by the molecular relation of the bases to the silica and clay in the decomposing silicate. This relation best characterizes the condition of the soil.

The determination of the silica by the hydrochloric acid method according to Van Bemmelen is to be recommended. The molecular calculation of results of analysis should also include the uncombined bases.

The use of the Mitscherlich method of determining hygroscopicity is urgently recommended in the investigation of soils and the use of the method of calculation in equivalents advanced by De Sigmond (E. S. R., 28, p. 318) is discussed.

The molecular calculation is considered valuable whether dealing with a physical or a chemical combination in the weathered complex. It is of equal value for the calculation and judgment of soils whether the neutral reaction is due to the existence of neutral aluminum silicates or to an absorption maximum which shows the same molecular relation as the neutral aluminum silicate and whether the acid reaction is due to acid aluminum silicates or to absorptively unsatisfied gels of silica and alumina.

Earth flows and structure soil in polar and subpolar regions, K. Sapper (*Internat. Mitt. Bodenk., 4 (1914), No. 1, pp. 52–67; abs. in Rev. Sci. [Paris], 52 (1914), I, No. 12, p. 370*).—The soil flows occurring in polar and subpolar regions are said to differ from those of tropical regions in that they are less fluid and the stone and earth constituents are not as a rule separated into homogeneous groups and layers by gravity. The soils are either homogeneous or heterogeneous according to the slope of the ground and the degree of the sorting and separating action produced by freezing and thawing, capillarity, and alternate wetting and drying.

The polygon and thufur soils of these regions (E. S. R., 30, p. 515) are said to occur in the more homogeneous forms of flowing soil, the so-called stone strips, nets, rings, and fields in the more heterogeneous forms. Several theories are advanced as to the exact manner of their formation.

Knox County soils, C. G. Hopkins, J. G. Mosier, J. H. Pettit, and J. E. Readhimer (*Illinois Sta. Soil Rpt. 6 (1913), pp. 43, pls. 2, figs. 5*).—This is the sixth of the series of the Illinois county soil reports, and deals briefly with the physiography, topography, and formation of the soils, and more fully with soil material and soil types, chemical composition of the soil, and field tests of the fertilizer requirements of certain of the prevailing types.

Knox County lies in the upper Illinois glaciation. The soils of the county are divided into three classes as follows: "(1) Upland prairie soils, rich in organic matter. These were originally covered with wild prairie grasses, the partially decayed roots of which have been the source of the organic matter. The flat prairie land contains the higher amount of this constituent because the grasses and roots grew more luxuriantly there and the higher moisture content largely preserved them from decay. (2) Upland timber soils, including those zones along stream courses over which forests once extended. These soils contain much less organic matter because the large roots of dead trees and the surface accumulations of leaves, twigs, and fallen trees were burned by forest fires or suffered almost complete decay. The timber lands are divided chiefly into two classes—the undulating and the hilly areas. (3) Swamp and bottom lands, which include the flood plains along streams and some small peaty swamp areas. . . .

"More than half the entire county is covered with the common prairie soil known as brown silt loam, and about one-third consists of two upland timber types, the yellow silt loam (hilly) and the yellow-gray silt loam (undulating), the former occupying almost one-fifth of the entire county. . . .

"The most significant fact revealed by the investigation of the Knox County soils is the low phosphorus content of the common brown silt loam prairie."

Soil investigations, [L. T. SHARP] (*Nevada Sta. Rpt. 1913, pp. 24–38*).—The first part of this paper discusses the soils of Nevada relative to fertility and crop production, and the second part reports the status of scientific investigations looking to soil improvement.

Chemical analyses of representative soil types show them to be "intrinsically rich in mineral plant food and naturally deficient in nitrogen." Alkali was present in various amounts in almost all the soils examined.

A series of experiments on the biological fixation of nitrogen did not warrant definite conclusions, but, "the evidence at hand . . . on the whole is rather favorable to the explanation of the accumulation of nitrates in Colorado soils . . . by Headden and Sackett" (E. S. R., 29, p. 621; 30, p. 818).

Studies of bacteria in soils as affected by irrigation showed that the water content most suitable for ammonification was not the optimum condition for nitrification. Ammonification was most rapid with 25 per cent water content, and was not markedly affected by differences of 3 per cent in water. On the other hand, 19 per cent of water was most advantageous for nitrification, and the rate of nitrification decreased over 50 per cent as the water content increased to 25 per cent. "It is probable that 18 to 20 per cent of water is the most suitable water content for this soil, . . . for the bacterial processes taking place in it."

Studies of colloids as protective substances for bacteria, particularly in the presence of alkalis, showed that aluminum hydroxid rendered sodium chlorid and sodium sulphate in solution at certain concentrations less toxic. Aluminum hydroxid and colloidal starch were more or less toxic to pure cultures of ammonifying organisms and slightly depressed ammonification with mixed cultures. Aluminum hydroxid stimulated nitrification to some extent.

Heat movement in pseudo-isotropic soil, A. v. ANDERKÓ (*Met. Ztschr., 30 (1913), No. 12, pp. 580–589*).—A mathematical exposition of heat movement in soils is given. This is based on the assumptions that a homogeneous pervious soil stratum, which would be isotropic but for the effect of meteorological factors and ground water variations, may be considered pseudo-isotropic, and that the sum of the factors, including amplitude, phase, and variations in heat capacity and conductivity, which influence heat movements in pseudo-isotropic soils, may be expressed by Fourier's law and modifications thereof.

An erosion study, G. N. COFFEY (*Jour. Amer. Soc. Agron., 5 (1914), No. 4, pp. 230–232*).—A method described for measuring the amount of material removed in suspension and solution from the surface of a given area consists of surrounding a small plat on all sides except the upper one with a split glazed tile surface drain so that surface wash from the plat is carried into this drain and thence through a pipe to a steel tank. For determining the plant food carried away in the drainage water two lines of tile are placed 30 in. deep surrounding the plat, the inner line being for the purpose of collecting subsoil drainage from the plat and the outer line for removing surrounding subsoil water.

Lysimeter investigations, 1913, G. RICHTER (*Mitt. Kaiser Wilhelms Inst. Landw. Bromberg, 6 (1914), No. 3, pp. 213–224*).—This is a brief account of a continuation of work by Krüger previously noted (E. S. R., 29, p. 125). It

reports investigations on the water economy of soil under summer barley and lupines as a stubble crop, on the influence of cultivation on evaporation, and on the approximate evaporation from plants and soil surfaces after sprinkling.

Fallowed soil had a greater and soil planted to barley a less water content at the end of the vegetation period than at the beginning. Evaporation from fallow soil was 31 per cent and from the planted soils between 88 and 93 per cent of the rainfall and of the water artificially applied. The average transpiration by the barley plants was 68 per cent of the total evaporation. With lupines as a stubble crop the difference in evaporation from fallow and planted soil was less than with barley, the average transpiration from the crop being 58 per cent of the total evaporation. Owing to its wastefulness of water, however, the cultivation of lupine as a stubble or intermediate crop is thought to influence unfavorably the soil water balance particularly in light soils. Cultivation appreciably decreased evaporation and increased the quantity of water taken up by the soil. The evaporation after sprinkling varied, being on the average somewhat greater from fallow than from planted soil. The average approximate evaporation from the planted soil was 8 per cent of the water added. On the average the immediate loss by evaporation after sprinkling was at the rate of about 2,000 gal. per acre regardless of the amount of application.

It is concluded that the larger the application of water the better if due consideration be given the type of soil and plant and the limits of economy.

The effect of heat upon the solubility of the mineral constituents of the soil, W. McGeorge (*Jour. Indus. and Engin. Chem., 6 (1914), No. 3, pp. 223–227*).—The investigations on which this article is based have already been noted from another source (E. S. R., 30, p. 419).

The decomposition of cellulose in moor soil and peat, Wanda Daszewska (*Bul. Soc. Bot. Genève, 2. scr., 4 (1912), No. 7, pp. 255–316*).—Numerous species (some of them new) of micro-organisms isolated from moor soils or from peat are described and their behavior toward the decomposition of cellulose was studied.

The decomposition of cellulose by these organisms did not result in the formation of brown humus products. The hyphomycetes were more active in decomposing cellulose in the soil than bacteria. The dark color of humus is thought to be probably due to the color of mycelium and spores, to the brown and black pigments, and also to oxidizing substances (ferments) secreted by most of the hyphomycetes. The hyphomycetes bring about an aerobic decomposition of cellulose by means of cytase. The organisms grow in a water extract of peat if provided with a supply of carbon, cellulose being suitable in case of organisms which decompose this substance.

A bibliography of the subject is given.

The decomposition of soil carbonates, W. H. McIntire (*Science, n. scr., 39 (1914), No. 1001, pp. 361, 362*).—A brief note is given on investigations which have shown that calcium and magnesium carbonates quickly disappear as such when applied to the soil and which indicate that the magnesium carbonate and, to a less extent, the calcium carbonate react with and are fixed by silica. Titanium oxid was found to bring about the same decomposition as silica. The evidence secured indicates that magnesium carbonate does not exist in soils of humid climates.

Management of soils to prevent blowing, W. M. Jardine (*Jour. Amer. Soc. Agron., 5 (1914), No. 4, pp. 213–217, pls. 3*).—Attention is drawn to the injurious blowing of soils in the Great Plains area and methods of prevention are proposed. The importance of keeping the surface of blowing soils rough or corrugated is noted, and implements such as the alfalfa cultivator, springtooth harrow, corn cultivator, and the lister in extreme cases, are said to be

well adapted for their cultivation. Manure, straw, and trash also furnish effective protection when spread upon the land uniformly. "More extreme measures must be taken with [sandy soils], such as farming in strips, [and] allowing weeds or other vegetation to grow and form windbreaks on the alternate strips."

Contribution to the physiology of soil, BERNBECK (*Forstw. Centbl., n. ser., 36 (1914), No. 1, pp. 26–44*).—This article discusses the importance of the "physiological depth" of soils, i. e., the depth of the soil layer in which roots grow, particularly in its relation to the free circulation of moist air in forest soils. Various means of increasing the physiological depth are described.

The distribution of bacteria in various soil types, H. J. CONN (*Jour. Amer. Soc. Agron., 5 (1914), No. 4, pp. 218–221*).—The results of studies of the microflora of 14 different soils make "it evident that, both quantitatively and qualitatively, there is surprisingly little variation between the bacteria of different soils. Soil has its own distinctive types of bacteria, and they are not many in number." The predominating types observed in cultures in ordinary media, and not including nitrifying, nitrogen-fixing, and other forms, were as follows: (1) Peritrichic, spore-bearing, long rods (5 per cent)—*Bacillus mycoides*, *B. subtilis*, *B. megatherium*, and an unnamed type; (2) nonspore-bearing, short rods (50 per cent)—liquefying type (unnamed), and nonliquefying type (unnamed); (3) Pseudomonas (5 per cent)—*P. fluorescens* (liquefying), and nonliquefying type (unnamed); (4) Actinomycetes (40 per cent)—*A. chromogenus* (?) and *A. albus*.

"In every soil studied, whether a muck, a clay loam, a loam, or a sand, all of these types were found and no others occurred in appreciable numbers."

Real and apparent nitrifying powers, P. L. GAINEY (*Science, n. ser., 39 (1914), No. 992, pp. 35–37; abs. in Chem. Abs., 8 (1914), No. 5, p. 978*).—Data are presented to show that deducting the nitrate nitrogen originally present or that in an incubated check as is done in two of the methods commonly used to determine the nitrifying power or efficiency of soils does not give correct results when easily decomposable organic nitrogenous substances are added to soils containing nitrate nitrogen.

"Simply taking as the correct factor the amount found at the final analysis will probably approach nearer the truth than any other method now in practice." However, this method gives only the apparent nitrifying power of the soil since "there is absolutely no way of determining the actual amount formed that immediately disappears."

Studies on soil protozoa, A. CUNNINGHAM and F. LÖHNIS (*Centbl. Bakt. [etc.], 2. Abt., 39 (1914), No. 23–25, pp. 596–610*).—The investigations reported dealt with the growth of protozoa on various media and the effect of heat on active and encysted forms.

The death point of active and encysted protozoa was found to be for flagellates 44° C. (active forms), 70–72° (cysts); for ciliates 54° (active forms), 72 (cysts); and for amœbæ 48° (active forms), 72° (cysts).

"In the case of the cysts the figures obtained are quite constant for the three forms of protozoa examined. The active forms, however, show marked differences in their power of resistance and it is noteworthy that the latter appears to be roughly in proportion to the average size of the individuals.

"The results show quite a marked difference between the powers of resistance to heat of the cysts and the active organisms—a difference at all events quite large enough to allow of the selection of an intermediate temperature which will kill all active forms but leave the cysts uninjured. In the fixing of this temperature, however, the retarding effect which heat has had upon excystation in these experiments must be kept in mind. It will, therefore, be

advisable to take a temperature as little above the death point of the active ciliates as is absolutely necessary to insure the killing of these organisms. Probably a temperature of 58 to 60° would be suitable for this purpose."

The action of antiseptics in increasing the growth of crops in soil, E. J. RUSSELL and W. BUDDIN (*Jour. Soc. Chem. Indus., 32 (1913), No. 24, pp. 1136–1142 figs. 5; abs. in Chem. Zentbl., 1914, I, No. 8, pp. 806, 807; Rothamsted Expt. Sta., Harpenden Ann. Rpt. 1913, pp. 17, 18).*—In continuation and extension of previous work (E. S. R., 28, p. 538; 29, p. 122; 30, p. 219) the authors studied the relative effectiveness of individual volatile and nonvolatile antiseptics for partial sterilization of soils.

The action of toluene is said to be typical of that of the whole class of volatile antiseptics studied as it causes first a decrease and then an increase and also a change in type in the micro-organic population of the soil, the suspension of nitrification, a marked increase in ammonia production, and the liberation of very small amounts of ammonia. The volatile antiseptics studied are classed in order of their effectiveness as follows: Toluene, carbon bisulphid, benzene, cyclohexane, chloroform, ether, hexane, and methyl and ethyl alcohols.

"The nonvolatile antiseptics present a more complex case because they persist in the soil and modify the development of the bacterial flora." Cresol is said to be typical of this class and its later effects differ from those of the volatile antiseptics in that the bacterial numbers are unusually increased, the flora is less mixed and very simple, and the high numbers of organisms do not persist but decrease rapidly to the numbers in untreated soil. "Simultaneously there is an increase in the amount of ammonia formed in the soil, but nothing corresponding to the increase in bacterial numbers." Phenol resembles cresol in its action but the rise in bacterial numbers is more marked and there is an even smaller production of ammonia. Hydroquinone behaves somewhat like phenol, the quinone is similar but is less potent. Formaldehyde is normal in its initial behaviour but subsequently there is a marked rise in the amount of ammonia produced but no increase in the bacterial numbers above what occur in the untreated soil.

"Pyridin is the nearest approach to a nitrogenous antiseptic. All the nonvolatile antiseptics in higher doses bring about a depression in the amount of nitrate revealed by analysis."

As regards their beneficial effect on plants grown in pot experiments with soils containing disease organisms the antiseptics tested are classed as follows: Most effective, formaldehyde and pyridin; medium, cresol, phenol, calcium sulphid, carbon bisulphid, toluene, benzene, and petrol; least effective, higher homologues of benzene and naphthalene and certain of its derivatives. "None of these antiseptics is as good as steam, either in increasing the amount of ammonia in the soil, in killing insect and fungoid pests, or in inducing a good fibrous root development."

It is concluded that antiseptics may be used with advantage in practice where the crop yield is limited by the supply of nitrogenous plant food, and where disease organisms and other detrimental forms are present and the micro-organic population of the soil has lost much of its effectiveness in producing ammonia from the nitrogen compounds therein.

A list of previous articles on the subject is given.

Fertilizers and soil organisms, C. LUMIA (*Mem. R. Accad. Lincei, Cl. Sci. Fis., Mat. e. Nat., 5. ser., 9 (1913), No. 12, pp. 457–471*).—The results of the author's investigations and observations confirm results obtained in previous work (E. S. R., 14, p. 647). He concludes that the mineral constituents of fertilizers and also carbohydrates exert a direct and favorable action on the micro-organisms of the soil, and may be in part utilized directly by some of

the higher plants, but have more frequently an indirect effect on plants by furnishing conditions favorable to organisms which supply them with nitrogen compounds and render phosphoric acid soluble.

The purpose and interpretation of fertilizer experiments, G. N. COFFEY (*Jour. Amer. Soc. Agron., 5 (1914), No. 4, pp. 222–230, fig. 1*).—The principal points emphasized in this article are (1) the need of greater uniformity in the methods of fertilizer experimentation in order that the results secured may be more nearly comparable; (2) the advisability of determining the relative need of a soil, and of different soils, for the different fertilizing elements; (3) the reliability of the results secured from the use of the elements alone for this purpose; (4) the suggesting of a line along which it may be possible to work out a satisfactory plan for obtaining this information; and (5) the proposing of a method by means of which it may be possible to interpret the results of fertilizer experiments in a way most easily understood by the farmer.

The plan proposed would involve simple uniform tests of the three fertilizing constituents separately on all important soil types and from data so obtained calculating the most profitable fertilizer combinations to use. Such a method, based on tests of single fertilizer constituents at Wooster and Strongsville, Ohio, is applied in this article to experiments made at the two places named and at the Pennsylvania Station. The method of calculation is stated as follows: $\frac{A \times IN}{IP} \times \frac{CP}{CN} = X$, where A=amount of nitrogen (or potash) applied; IN=increase from nitrogen (or IK from potash); IP=increase from phosphorus; CP=cost of phosphorus; CN=cost of nitrogen (or CK cost of potash); and X=relative proportion for most profitable returns.

"The first part of the formula is predicated upon the theory that the relative need of a soil for the elements is proportional to the increases produced by these elements; the second upon the theory that the amount of these elements used should be varied in proportion to their cost. While these theories may not hold absolutely true, they probably represent as near an approach to a general statement as can be made at the present time."

On the plans of fertilizer experiments, P. L. GILE (*Jour. Amer. Soc. Agron., 6 (1914), No. 1, pp. 36–41, fig. 1*).—The application of the law of minimum as enunciated by Liebig and modified by Mitscherlich to field experiments is discussed, and it is pointed out that while the plain principles which common sense and the experience of investigators show should govern in the planning and execution of fertilizer tests are universally recognized they are not always followed. There are various considerations which make it probable that the increased growth of crops resulting from an increase of the element in minimum is represented by a curve as Mitscherlich holds and not a straight line as Liebig's definition of the law of minimum indicates. This is in accord with Hall's application of the law of diminishing returns to fertilizer experiments and with the excess (Luxus) consumption by plants of a fertilizer added in increasing amounts.

"With the variable conditions that field experiments are subject to, it is doubtful if the increased growth caused by fertilizers will often follow exactly the theoretical rate. For this reason it seems that a plan of a fertilizer test somewhat as follows would give results which are more accurate than many of the present plans for such experiments and yet afford conclusions that are not dependent on theoretical considerations.

"In a test of the availability of different forms of nitrogen, for instance, all the plats should receive phosphoric acid and potash in considerable excess. The standard, or most available form of nitrogen, as nitrate of soda, should be applied in several quantities, say at the rate of 20, 30, 40, 60, and 90

lbs. of nitrogen per acre, while all the other forms of nitrogen could be applied at the rate of, say 50 lbs. of nitrogen per acre. Then a comparison of the yields would show whether 20, 30, 40, or 60 lbs. of the standard form of nitrogen were required to give the same yield as the 50 lbs. of the unknown form of nitrogen. The ratio of the quantities giving the same yields would give the relative availabilities.

"Such a plan would show whether or not the quantities of fertilizers tested were in minimum and thus guard against errors which sometimes occur. The conclusions would also be valid whether Liebig's or Mitscherlich's law of minimum is the correct one. . . .

"The objection to this plan is that it multiplies the number of plats and so necessitates a larger area for the experiment. It seems better, however, to increase the number of different treatments by two or three, and so increase the accuracy of the whole work. If it is impracticable to test four or five quantities of the standard, or most available fertilizer, at least two quantities should be used, so that it will be evident that the smaller quantity (which can be used for the comparison) is not present in excess of the crop's requirements."

Row fertilizing experiments, AHR (*Mitt. Deut. Landw. Gesell., 29 (1914), Nos. 7, pp. 94–98; 8, pp. 123–125*).—The general outcome of the experiments here reported was that with cereals row fertilizing showed no advantage over the usual method of application. With beets, however, the results were decidedly better with row fertilizing.

Pond fertilizing experiments, KUHNERT (*Monatsh. Landw., 6 (1913), No. 12, pp. 353–371*).—Experiments with various fertilizing materials and mixtures to promote the growth of food plants and thus increase the fish product of ponds are reported.

An incompatibility in fertilizer mixing, T. E. KEITT (*Abs. in Science, n. ser., 39 (1914), No. 1001, pp. 363, 364*).—It is stated that "when basic slag is mixed with muriate of potash or kainit a large proportion of the potash becomes insoluble in water. The insoluble compound thus formed is very slightly soluble in neutral ammonium citrate of sp. gr. 1.09, and only slightly soluble in citric acid, but is readily soluble in hydrochloric acid of sp. gr. 1.1115."

Injuries to the cornea by artificial fertilizers, J. EICKMEYER (*Über Hornhautverletzungen durch künstliche Düngemittel. Inaug. Diss., Univ. Rostock, 1911; abs. in Zentbl. Biochem. u. Biophys., 14 (1912), Nos. 3–4, p. 154*).—Tests were made with rabbits to verify some clinical findings noted in man as to the effect of artificial fertilizers on the eye.

Superphosphates were found to produce a slight conjunctivitis and a transient cloudiness of the cornea; Thomas slag produced a marked conjuctivitis with a transient turbidity of the cornea and residual scars; calcium cyanamid incited a marked neurotic conjunctivitis and also keratitis. When brought on the cornea as a paste these substances showed a marked toxicity.

The trade in fertilizing materials, M. LAMBERT (*Jour. Agr. Prat., n. ser., 27 (1914), No. 7, pp. 214–216*).—This article briefly discusses recent developments in the trade in sodium nitrate, ammonium sulphate, calcium cyanamid and nitrate, phosphates, and potash salts.

Consumption, production, and commerce in artificial fertilizers in Russia, PIETTRE (*Bul. Mens. Off. Renseig. Agr. [Paris], 12 (1913), No. 5, pp. 585–587*).—Statistics of consumption, importation, and production during the last ten years are briefly summarized showing that, while the total amount of fertilizer used in Russia is still comparatively small, there has been a remarkable increase both in importation and home production during recent years.

Source, availability, and suitability of different forms of plant food constituents to different crops, C. B. WILLIAMS (*North Carolina Sta. Circ. 11 (1914), pp. 5*).—This is a brief popular discussion of the subject.

Composition and fertilizing value of farm crops and other farm materials, C. B. WILLIAMS (*North Carolina Sta. Circ. 6 (1913), folio*).—Tables show the fertilizing constituents, the value of various farm products, and other data.

[The guano situation in Peru] (*Peru To-day, 5 (1913), Nos. 4, pp. 858, 859; 6, pp. 957–959; West Coast Leader, 2 (1913), No. 80, p. 11; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 2, pp. 204–207*).—From reviews of the annual report of the Peruvian Guano Company for the year ended March 31, 1913, and the financial message of the President of the Republic dated September 5, 1913, it is noted that the guano extracted during the year for domestic use in accordance with the agreement between the Peruvian Government and the guano company entered into in 1909 was 24,350 (Spanish) tons of high grade guano containing 9.18 per cent of nitrogen (which was only 20 per cent of the amount demanded by the users) and 12,242 tons of low grade guano containing less than 3 per cent of nitrogen. The total amount of guano extracted under this agreement since 1909 has been high grade 93,297 tons, low grade 44,044 tons, or a total of 137,341 tons. The Peruvian corporation which assumed certain obligations of the Peruvian Government in 1890 in exchange for the right to extract and export guano not to exceed 2,000,000 tons has exported to date 1,134,918 tons. It is stated that from 1841 to 1879, when the industry was at its height, over 12,000,000 tons of guano was exported.

Realizing that the frequent disturbance of the guano-producing birds consequent upon unrestricted extraction of the guano is seriously interfering with the renewal of the deposits, the Peruvian Government has employed experts to report upon means of preventing the disappearance of the birds and has taken steps to provide for rotation in working the deposits and a closed season of five months each year to protect the birds.

Peat-moss litter, W. F. TODD (*Jour. Amer. Peat Soc., 6 (1913), No. 4, pp. 161–166; abs. in Engin. Mag., 46 (1914), No. 6, pp. 985–987*).—Attention is called to the deodorizing, disinfecting, and absorbent properties of peat moss which specially fit it for use as a litter. It is said to furnish good bedding, to keep the hoofs of animals in good condition, and to yield a very valuable manure in which flies do not breed.

Sulphate of ammonia industry of Germany, R. P. SKINNER (*Daily Cons. and Trade Rpts. [U. S.], 17 (1914), No. 54, p. 878*).—Brief reference is made to the activities of two large rival firms manufacturing ammonium sulphate in Germany, and statistics of imports and exports of this material are given.

It is stated that the imports were 34,626 metric tons in 1913 as compared with 23,097 tons in 1912. The exports amounted to 75,868 tons in 1913 as compared with 56,948 tons in 1912. The exports to the United States amounted to 5,629 tons in 1913.

Potash shipments during 1914, R. P. SKINNER (*Daily Cons. and Trade Rpts. [U. S.], 17 (1914), No. 56, p. 909; Commercial Fert., 8 (1914), No. 3, p. 16; Jour. Indus. and Engin. Chem., 6 (1914), No. 5, p. 429*).—Statistics of the deliveries for domestic and foreign consumption during the year 1914 in accordance with the provisions of the Potash Syndicate law and of actual exports of potash salts from Germany during 1912 and 1913 are given.

The deliveries agreed upon are for domestic consumption 635,300 metric tons of pure potash, and for foreign consumption 531,300 tons. The total exports in 1913 amounted to 1,829,617 metric tons valued at $22,164,000.

Occurrence and composition of some Alabama phosphates, B. B. Ross (*Abs. in Science, n. ser., 39 (1914), No. 1001, p. 363*).—It is stated that "large quantities of phosphate-bearing strata are found in Alabama, apparently closely associated with a thick bed of rotten limestone and with green sands: their formation is ascribed to a leaching of this phosphatic limestone. This view is confirmed by analyses of boulders, which showed that the weathered layers contain considerably less phosphate than the unweathered portion. Much of this phosphate deposit could not be worked economically at the present time, but it may be capable of later development when other fields become partly exhausted. The green sands contain both potash and phosphate, and many possess local value as a fertilizer."

On the action of lime and magnesia in the nutrition of plants, E. Haselhoff (*Landw. Jahrb. 45 (1913), No. 4, pp. 609–633; abs. in Ztschr. Angew. Chem., 27 (1914), No. 37, Referatenteil, p. 298*).—A series of pot experiments with different crops are reported, the results of which do not substantiate Loew's theory regarding the necessity for a definite ratio of lime to magnesia for each kind of crop.

Catalytic fertilizers, magnesium salts, etc., O. Munerati (*Bol. Quind. Soc. Agr. Ital., 19 (1914), No. 4, pp. 116–119*).—A number of experiments with manganese sulphate and magnesium sulphate, which gave results not entirely conclusive but generally showing some increase from the use of these substances, are reported.

Catalytic fertilizers, E. Boullanger (*Vie Agr. et Rurale, 2 (1913), No. 9, pp. 244–247*).—This is a summary of results of experiments by the author and others with manganese salts on oats, wheat, barley, beets, potatoes, grasses, and garden vegetables, and with aluminum and sodium silicates and iron sulphate on garden crops. The results were not conclusive but are thought to warrant further investigation.

Radio-active fertilizers, L. Malpeaux (*Vie Agr. et Rurale, 2 (1913), No. 9, pp. 241, 242; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1913), No. 4, p. 563; Chem. Abs., 8 (1914), No. 5, p. 979*).—A mineral substance showing a small degree of radio-activity was used at rates of from 22 to 40 lbs. per acre in combination with the ordinary fertilizing materials in pot and field experiments. The radio-active material apparently increased the yield of oats and crimson clover in pot experiments and of oats, mangels, and sugar beets in field experiments. It exerted no effect on the composition of the sugar beets.

Recent experiments on the fertilizing action of sulphur, E. Boullanger (*Vie Agr. et Rurale, 2 (1913), No. 9, pp. 247, 248*).—A very brief note is given on recent experiments tending to show the importance of sulphur as a fertilizer.

Fertilizer inspection (*Maine Sta. Off. Insp. 53 (1913), pp. 105–140*).—Reports of analyses of samples of fertilizers found on sale in Maine in 1913 are published in this circular, together with other pertinent information relating to the inspection, composition, valuation, and use of fertilizers, along the lines previously noted (E. S. R., 28, p. 126).

Inspection and analyses of commercial fertilizers, 1913, P. F. Trowbridge (*Missouri Sta. Bul. 116 (1914), pp. 347–399*).—Analyses and valuations of about 500 samples of fertilizers examined during the year are reported. It is stated that the amount of fertilizer sold in the State during the year was far in excess of that of any previous year.

Tabulated analyses of commercial fertilizers (*Penn. Dept. Agr. Buls. 242 (1913), pp. 87; 244 (1914), pp. 65*).—These two bulletins give in detail the results of inspection, including analyses and valuations of fertilizers in Pennsylvania in 1913.

AGRICULTURAL BOTANY.

Plant life, J. B. FARMER (*New York and London, 1913, pp. 255, figs. 28*).—In this book the author has sought to describe the salient features of plant life from the viewpoint of function. Technicalities have been avoided as much as possible and he has purposely omitted many things usually given in such a work in order to treat of matters not generally discussed in popular treatises.

A recording transpirometer, V. H. BLACKMAN and S. G. PAINE (*Ann. Bot. [London], 28 (1914), No. 109, pp. 109–113, pl. 1, fig. 1*).—The authors describe an instrument that is said to be comparatively accurate and of low cost which is believed to be well adapted for physiological experiments.

Anatomical investigations on the relation between structure and physiological characters of plants, O. V. ÎAKUSHKIN and N. VAVILOV (*Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 13 (1912), No. 6, pp. 830–861*).—Describing and summarizing studies carried out by them in relation to the views of Kolkunov (E. S. R., 20, p. 129; 21, p. 543) to the effect that there exists a correlation between the size of leaf cells and stomata on the one hand and the physiological characters (as related to drought resistance, productivity, etc.) on the other, the authors state that their findings rather oppose than support such correlation.

The reciprocal relations between anatomical coefficients and physiological characters of plants, V. V. KOLKUNOV (*Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 14 (1913), No. 6, pp. 321–340*).—A reply to the above, presenting further arguments in support of the author's views.

A contribution to the physiology of the purple sulphur bacteria, M. SKENE (*New Phytol., 13 (1914), No. 1–2, pp. 1–17*).—The author gives the results of investigations on some of the purple sulphur bacteria, in which he states that attempts to obtain pure cultures have been without success. In mixed cultures Amœbobacter, and probably also Lamprocystis, thrive best in mineral solutions containing ammonium sulphate as a source of nitrogen and lime as a neutralizing agent. Organic sources of nitrogen and carbon, as far as tested, were unfavorable and in general inhibited the growth of the bacteria. Development of these organisms can take place only in the presence of hydrogen sulphid and growth only in the presence of light. The purple sulphur bacteria require free oxygen, which is probably supplied them by associated green organisms.

Some toxic and antitoxic effects in cultures of Spirogyra, W. D. HOYT (*Bul. Torrey Bot. Club, 40 (1913), No. 7, pp. 333–352*).—A report is given of experiments conducted to determine a nutrient solution suitable for algal growth under laboratory conditions.

Crone's solution was found to be the best solution tested, while that of Molisch was almost as satisfactory. Sachs's solution and that of Knop were decidedly unfavorable. Tap water and ordinary distilled water of the laboratory were found markedly toxic to this species of Spirogyra. The toxicity of tap water was partially removed by concentrating it and was entirely removed by heating to 144° C., or by distillation in glass. The toxicity of ordinary distilled water was partially corrected by adding to the culture lime, chalk, solid agar, dry sphagnum moss, colloidal platinum, or other absorbents.

The results obtained seem to indicate that the toxic materials present in the tap water were almost wholly volatile, while those in distilled water were mostly nonvolatile, probably derived from the supply pipes and from the still. Where potassium nitrate, potassium phosphate, potassium chlorid, magnesium sulphate, and calcium chlorid were used singly or in combination, a mixture of the three potassium salts was found as toxic as potassium chlorid used

alone. Potassium chlorid, magnesium sulphate, and calcium chlorid were found to be extremely toxic when used singly, but mixtures of any two were less toxic than a solution of a single compound. Good growth was obtained only when the salts of all three metals were present in favorable proportions. The toxicity of magnesium sulphate was completely counteracted by potassium chlorid or by calcium chlorid. Weak solutions of some of the toxic salts were improved by the addition of animal charcoal or colloidal platinum, and it seems the effect of powdered calcium carbonate in counteracting the toxicity of the nutrient salts was due in part to the adsorptive action of the solid.

Recent studies on gaseous exchanges of green plants with the atmosphere. L. MAQUENNE and E. DEMOUSSY (*Nouvelles Recherches sur les Échanges Gazeux des Plantes Vertes avec l'Atmosphère. Paris, 1913, pp. 166, pls. 4, figs. 3*).—This is a somewhat detailed account of the authors' more recent work (E. S. R., 29, p. 27). It includes findings and deductions from studies, chiefly on *Euonymus japonica*, regarding respiration of leaves under different conditions, such as darkness and variable pressure, also an exposition of methods employed in measuring respiratory coefficients of the influence of carbon dioxid contained in the air, of chlorophyll activity, etc. Of the more general conclusions stated at some length a few may be summarized as follows:

The respiratory coefficient of leaves is variably influenced by age and activity of the tissues; also by illumination and temperature, given degrees of which correspond to the chemical composition noted in the plant and are apparently related to the activity of diastases therein. When a plant is in equilibrium with external conditions there exists a simple relation between the real respiratory quotient thereof, its coefficient of absorption for carbon dioxid at the existing temperature, the density of the charge within the apparatus, and the apparent respiratory quotient in the same conditions, this relation permitting the approximate calculation of one of these magnitudes when the others are known.

The coefficient of absorption of carbon dioxid by green plants varies with temperature according to the law of solubility therefor. It appears to be for thin leaves about double the coefficient of solubility of pure carbon dioxid, which thus appears to supersaturate the cellular structure. The phenomenon of assimilation does not sensibly modify the relations between hydrogen and oxygen in the composition of vegetable tissues. The variations of ratio noted in gaseous exchanges, diurnal or nocturnal, between a plant and the atmosphere and consequently the changes of composition in the plant organs, are thought to be attributable mainly to the influence exerted by heat.

The respiration of plants under various electrical conditions, R. C. KNIGHT and J. H. PRIESTLEY (*Ann. Bot. [London], 28 (1914), No. 109, pp. 135–161, figs. 6*).—The authors state that field trials on the effect of electrical conditions upon plant growth (E. S. R., 23, p. 326) have suggested that an increased crop or an earlier ripening may be the result of such treatment. In the present paper an attempt has been made to analyze this apparent effect by determining the effect of such electrical conditions upon respiration.

The experiments have shown that direct currents of a density 10^{-6} to 10^{-4} amperes have no effect on the respiration of peas other than that due to accompanying changes of temperature. Overhead discharges producing a current of density less than 3×10^{-6} amperes have no effect on respiration. When higher currents were employed a definite increase of carbon dioxid was observed, which is attributed wholly to the rise of temperature caused by the discharge. In the field, where the currents are too small to produce any appreciable rise of temperature, the authors are of the opinion that electrifica-

tion would have no effect upon respiration, and that explanation for any acceleration of growth must be sought in other functions of the plant.

The gaseous products of electrical discharge in air are said to have no effect upon germinating peas but are deleterious to young seedlings.

Experimental and critical studies on freezing and frost killing in plants, N. A. MAXIMOW (*Jahrb. Wiss. Bot.* [*Pringsheim*], *53 (1914), No. 3, pp. 327–420, figs. 6*).—Reviewing briefly previous communications by himself (E. S. R., 28, p. 630) and others on the death point of plant cells as related to composition, concentration, and freezing points of the contained or containing solutions, the author gives details and results of his more recent studies, concluding that killing by cold is probably due not simply to low temperatures as such (implying a specific temperature minimum), but to physico-chemical changes set up in the plasma colloids during the formation of ice therein. A bibliography is appended.

A study of the effect of smoke and dust on plants, V. SABACHNIKOFF (*Contribution à l'Étude des Fumées et des Poussières Industrielles dans leurs Rápports avec la Végétation. Thesis, Univ. Nancy, 1913, pp. 252, pls. 10, figs. 8*).—The author gives a critical review of available literature on the subject, describing in detail some of the recent investigations conducted in Germany, Austria, and France.

An account is also given of his investigations on the effect of sulphuric acid in the air on the vitality and reproductive power of pollen and on the development of grain in wheat. Open flowers and growing heads of wheat plants were placed within aspirators and atmospheres containing known quantities of sulphuric acid were drawn over them. It was found that exposure for more than 24 hours to a concentration of more than 1:13,000 parts of sulphuric acid was fatal to the action of pollen and a proportion in excess of 1:30,000 was detrimental to the reproduction of plants. In the experiments with wheat at the time of flowering, sulphuric acid 1:10,000 completely prevented seed formation. A concentration of 1:30,000 notably reduced the average number and weight of the seed formed. Diminution in average weight was in proportion to concentration of sulphuric acid. The injury is considered to be largely confined to the reproductive organs of the plant.

A bibliography of more than 200 titles is given.

The occurrence of rennet in Rhizopus nigricans, M. DURANDARD (*Compt. Rend. Acad. Sci.* [*Paris*], *158 (1914), No. 4, pp. 270–272*).—The author reports experiments which demonstrated the presence of an active rennet in the mycelium of *R. nigricans* that rapidly coagulated milk at proper temperatures. The optimum temperature for the activity of the enzym was about 50° C., with a cessation of activity at 10°, and at 60° it was entirely destroyed. At a temperature of 55° the enzym required 50 times as long a period to bring about the coagulation of milk as was needed at the optimum temperature.

On the presence in leaves and flowers not containing anthocyanin of yellow pigments which may be transformed into anthocyanin, R. COMBES (*Compt. Rend. Acad. Sci.* [*Paris*], *158 (1914), No. 4, pp. 272–274*).—In continuation of his studies on the autumn coloration of *Ampelopsis hederacea* (E. S. R., 30, p. 729) the author has investigated a number of other plants to determine whether anthocyanin is formed by the transformation of other pigments. Studies were made of privet, several varieties of grapes, the foliage of some of which redden in autumn while others turn yellow, and of narcissus, the flowers of which contain a yellow pigment.

In the case of privet and the varieties of grapes that redden on the approach of winter, the red color is brought about by the oxidation of the yellow pigment

normally present in the leaves. In the varieties which have yellow leaves or which do not normally redden and in the yellow flowers of narcissus the pigment may be changed into a red coloring material by reduction.

On differential mortality with respect to seed weight occurring in field cultures of Pisum sativum, J. A. HARRIS (*Amer. Nat., 48 (1914), No. 566, pp. 83–86*).—Claiming to have shown previously (E. S. R., 28, p. 636; 29, p. 829) that for the dwarf varieties of *Phaseolus vulgaris* the mortality of apparently perfect seeds (failure to germinate or to complete the life cycle) is not random, the author reports on an extension of these studies to *P. sativum*. He states that in these Leguminosæ the mortality which occurs before germination is differential, but that in both cases wider series of experiments and refinement of methods of analysis are necessary to establish fully the nature and immediate (physical or chemical) cause of this selective death rate.

Studies in seedless fruits, G. NEGRI (*Ann. R. Accad. Agr. Torino, 55 (1912), pp. 517–581*).—The author gives the results of extended investigations on the subject of fruit development without seed formation, and describes apogamous, parthenocarpic, and other forms of fruit in which the ovary is stimulated to development without the ovules being fertilized. A bibliography is appended.

Origin of species in polymorphic genera, H. DE VRIES (*Rev. Gén. Sci., 25 (1914), No. 5, pp. 187–191*).—From his observations and experiments the author concludes that in as polymorphous a group of plants as Œnothera mutation is not a special quality of *Œ. lamarckiana* alone, but is also a characteristic of other species. It is held that mutation is a cause of the wide range of forms observed in many wild species as well as in cultivated forms of many plants. *Œ. lamarckiana* is considered as possessing a considerable number of characters that are in a state of very unstable equilibrium, and to this fact is due the succession of forms that have been experimentally derived therefrom.

The vegetation in the vicinity of Leyni in relation to agriculture, E. FERRARI (*Ann. R. Accad. Agr. Torino, 55 (1912), pp. 459–515*).—A report is given of a study of the various types of plant associations with reference to the possible agricultural adaptations of the soil.

The flower-finder, G. L. WALTON (*Philadelphia and London, 1914, pp. XXVI+394, pls. 17, figs. 573*).—This is a popular work for the identification of common wild flowers, and is designed for the novice who wishes to determine some of the more common fruits and flowers. The plan is to identify the flowers and fruits by their color and other marked characteristics. Charts are furnished for the different colors which are commonly represented in wild flowers, from which references to definite groups are given, and, except where only slight differences occur, all of the species are illustrated by line drawings.

FIELD CROPS.

Forage crops: Annual grasses and roots, C. G. WILLIAMS and F. A. WELTON (*Ohio Sta. Bul. 269 (1914), pp. 165–197, figs. 18*).—This bulletin gives cultural notes for corn for silage, sorghums, millets, rye, wheat, oats, mangels, sugar beets, turnips, and rape.

Tables show analyses and yields per acre of 8 varieties of corn for silage for 5 years. The total yields ranged from 4.86 to 20.71 tons per acre, protein from 463.6 to 567.6 lbs., crude fiber from 1,204.5 to 1,795.5 lbs., nitrogen-free extract 3,880.8 to 4,700.2 lbs., and fat from 94.5 to 144.8 lbs. per acre.

Results of tests for thickness of planting corn for the silo showed "that the differences in yield of corn per acre vary widely with the season. In 1909 and 1912 the 4-in. drilling led by a wide margin, while in 1911 and 1913 it was a little behind the 6-in., and but slightly ahead of the 10-in. In 4 of the 5 years

the 12-in. planting has given the lowest yield of all." During the seasons of excessive rainfall the 4-in. plantings make the large yields. In seasons when the rainfall is short or moderate the lead over the 12-in. planting is less than 1 ton per acre on the average.

Cane was found to be inferior to corn for silage under Ohio conditions.

In a variety test of both saccharin and nonsaccharin varieties of sorghums covering 7 years the average yields of green forage per acre ranged from 4.8 to 13.9 tons for the different varieties. Yields in millet variety tests for 7 years, including 9 varieties, ranged from 0.6 (Early Fortune broom corn) to 9.2 (Japan barnyard) tons per acre of dry forage.

Of oats and field peas it is noted, from tests in seeding them, 1:2, 1½:1½, and 2:1 bu. per acre, "that when total tonnage is the chief object, oats should predominate, and when the chief object is feed of high quality the peas should be in excess."

Plants introduced into a desert valley as a result of irrigation, S. B. PARISH (*Plant World, 16 (1913), No. 10, pp. 275–280*).—In this article the author notes the extent of occurrence of the following weeds that have been introduced into the Imperial Valley, Cal., incidental to crop cultivation: *Amaranthus palmeri, Ambrosia psilostachya, Aster exilus, A. spinosus, Atriplex semibaccata, Baccharis glutinosus, Brassica nigra, Chloris elegans, Chenopodium murale, Cynodon dactylon, Datura discolor, Echinochloa zelayensis, E. colona, Eclipta alba, Erigeron canadense, Helianthus annuus, Holcus halepensis, Leptochloa imbricata, Lippia nodiflora, Malva parviflora, Melilotus indica, Paspalum distichum, Pluchea sericea, Physalis wrightii, Portulaca oleracea, Salix exigua, Scirpus paludosus, Sclaria glauca, Sesbania macrocarpa, Sesuvium sessile, Sida hederacea, Solanum eleagnifolium, Sonchus asper, S. oleraceus, Tribulus terrestris, Xanthium commune,* and *X. canadense.*

Irrigation experiments, G. H. TRUE ET AL. (*Nevada Sta. Rpt. 1913, p. 17*).—One season's results of irrigation experiments with White Australian wheat and Siberian oats are here reported. The schedule of irrigation was based upon the time of heading of the grain and varied from 3 irrigations before and 2 after heading to 1 before and 1 after heading.

The largest yield of wheat, 549 lbs. per acre, was obtained with 2 irrigations before and 2 after heading, which applied water to the depth of 0.92 ft.; the smallest yield, 332 lbs. per acre, with 1 irrigation before and 1 after heading, which applied water to the depth of 1.08 ft.

With oats the largest yield, 340 lbs. per acre, was obtained with 1 irrigation before and 2 after heading, which applied water to the depth of 1.08 ft.; smallest yield, 232 lbs. per acre, was obtained with 1 irrigation before and 1 after heading, which applied water to the depth of 0.89 ft.

Comparative fertilizer experiments with lime nitrogen, sulphate of ammonia, and nitrate of soda on some hoed crops in 1912 (*Landw. Wchnbl. Schles. Holst., 63 (1913), No. 52, pp. 1040–1044*).—Compared on a basis of net returns, the nitrate of soda plat was the only one that gave a uniformly profitable yield with beets. The lime nitrogen and ammonia plats did not always show a net profit, although the average of seven tests gave a positive return.

With potatoes the only plats to give a uniformly profitable return were those that received lime nitrogen; the other plats showed fluctuations. The average of 5 tests shows a plus return with the sulphate of ammonia and a minus return with the nitrate of soda.

With cabbage the yields from the sulphate of ammonia plats were the only ones that gave a uniformly profitable net return, while both of the other plats gave some losses.

With cauliflower the plats all gave profitable returns, the largest being from the sulphate of ammonia plat.

All of the plats in the experiment received P_2O_5 and K_2O to make up a complete fertilizer for the crops.

Comparative fertilizer experiments with cereals in 1912. WEHNERT (*Landw. Wchnbl. Schles. Holst., 63 (1913), No. 51, pp. 1010–1016*).—In testing the value of lime nitrogen, nitrate of soda, and sulphate of ammonia on oats and barley the best yields of grain and straw were obtained with sulphate of ammonia in general on all classes of soil tested.

Soy beans and cowpeas, A. T. WIANCKO, M. L. FISHER, and C. O. CROMER (*Indiana Sta. Bul. 172 (1914), pp. 421–438, figs. 8*).—This bulletin, continuing previous work (E. S. R., 18, p. 1038), reports tests of cultural methods suited to Indiana conditions, includes some historical notes, and describes 18 varieties of soy beans and 11 varieties of cowpeas with yield data.

It is noted that both soy beans and cowpeas are well adapted to the climatic conditions of Indiana and that they have a wider soil adaptation than most of the common crops. One of the most important uses is regarded as sowing after harvest, on wheat or oat stubble, early potatoes, cannery peas, and as an orchard cover crop. Used in this way data show that after wheat, for the years 1909–1912, the average yield per acre of soy beans in green weight of tops was 10,660 lbs. and of roots to a depth of 18 in., 2,355 lbs., containing 81.8 and 10.9 lbs. of nitrogen, respectively. The average yield per acre of cowpeas in green weight of tops was 12,872 lbs. and of roots to the depth of 18 in. 2,691 lbs., containing 96.2 and 16.7 lbs. nitrogen, respectively.

Several years' experiments on methods and rates of planting soy beans for seed and hay production show that solid drilled, using about 60 lbs. seed per acre, gave larger yields per acre of both grain (21.7 bu.) and of hay (6,368 lbs.) than drilling in rows 24, 28, 32, 40, and 42 in. apart or broadcast. The seed yields with cowpeas were too small to warrant conclusions.

Chemical analyses, P. BIGLER (*Relat. Min. Agr. Indus. e Com., Brazil, No. 2 (1911), pp. 180–183*).—This gives in tabular form very complete analyses of 28 samples of sugar cane and of 81 samples of cassava.

Grass mixtures for North Carolina pastures, C. B. WILLIAMS (*North Carolina Sta. Circ. 9 (1913), pp. 6*).—Grass mixtures for permanent pastures in the coastal plains, Piedmont, and mountainous sections for uplands and lowlands are given, together with cultural notes.

The creeping rootstock of Agropyron repens, MARGERY KNIGHT (*Jour. Bot. [London], 51 (1913), No. 612, pp. 341–343, pl. 1*).—This article describes the plant as a whole and the structure of the stem, the structure and development of the leaf, and the origin of the leaf and roots.

Alfalfa in Kansas, W. M. JARDINE and L. E. CALL (*Kansas Sta. Bul. 197 (1914), pp. 577–610 figs. 15*).—This bulletin gives data on cultural methods, including inoculation, row seeding, handling of hay and seed crop, influence of alfalfa on soil fertility and on succeeding crops, rotation, and animal and insect pests.

The effect of 10 tons per acre of barnyard manure applied to wheat before seeding to alfalfa in 1907 on an old cultivated field was as follows: Yield of alfalfa in 1908, manured 8,560 lbs., unmanured 4,104 lbs.; in 1909, manured 11,856 lbs., unmanured 8,541 lbs. The effect of acid phosphate for 4 seasons, 1910–1913, was shown in an increased net income of $8.74 per acre. See also a previous note (E. S. R., 20, p. 473).

The management of blue-grass pastures, L. CARRIER and R. A. OAKLEY (*Virginia Sta. Bul. 204 (1914), pp. 3–18. figs. 8*).—The results in these experiments, conducted in cooperation with the Bureau of Plant Industry of this

Department, were measured in hay production and in gain in steers per acre that were pastured on the fields.

The results of 3 years' investigations have shown that "in the grazing experiments at Blacksburg, very little benefit was derived from the cultural treatment by disking and harrowing of blue-grass sod, indicating that this practice can not be recommended, at least without qualification.

"Heavy grazing gave 1,485 lbs. of gain on 2½ acres of land in 3 years. Light grazing gave 838 lbs. of gain in the same time on an equal area. The heavily grazed field had a more even turf and was much freer from weeds than the lightly grazed field at the close of the 5 years' experiment. More blue-grass pastures are injured by undergrazing than by overgrazing. Heavy grazing is not practicable on pastures used for finishing fat cattle, since it is necessary to have a surplus of grass in order to do this. In this case it is recommended that those areas of pasture that are worst infested with broom sedge and other weeds be fenced and grazed down closely with young stock or sheep for 2 years, until the sod has improved; then the pasture can be used again to finish fat cattle.

"Very little, if any, advantage was secured by grazing cattle in different fields, alternately, as compared with continuous grazing on the same field. The practice of alternate grazing is of doubtful value.

"The results reported here were obtained on a limestone soil, and on a blue-grass red-top pasture. Whether the same results would be obtained on other types of soil or on other grasses, we can not say."

A series of plat experiments with fertilizers for weed eradication is in progress, and while not continued long enough to justify conclusions indicates that it will pay to use from 200 to 300 lbs. acid phosphate per acre every five or six years on ordinary blue-grass pastures.

The premier clover for North Carolina farmers, C. B. WILLIAMS (*North Carolina Sta. Circ. 7 (1913), pp. 5*).—Methods of culture, harvest, and grazing are given for crimson clover with notes on food value.

Crimson clover: Utilization, J. M. WESTGATE (*U. S. Dept. Agr., Farmers' Bul. 579 (1914), pp. 10, figs. 7*).—Continuing a previous publication (E. S. R., 29, p. 633), the author discusses the time of cutting, harvesting, spontaneous combustion, feeding value, and hair balls in considering crimson clover as a hay crop. Instances are noted in which this crop has been also successfully used as a soiling crop, as pasture, as a soil improver, and as a cover crop.

The growth of maize on cogon soil, A. F. NAVARRO (*Philippine Agr. and Forester, 2 (1912), No. 1–3, pp. 11–18*).—This paper reports the results of pot experiments in which cogon soils were leached with NH_3, with water, burned, and treated with chemical sterilizers, chemical fertilizers, stable manure, and silkworm excrement. In order to discover a method of making this kind of soil productive, leaf measurements of the corn plants were taken daily and the following conclusions drawn:

"The application of lime to cogon soil is decidedly beneficial. The cogon soil used was deficient in nitrogen in whatever form. The applicaton of manure, obtained from the stable or silkworm house, results in much more active growth. The sterilization of the soil is beneficial. Various methods of improving the growth of maize on cogon land have been found, but no practical solution of the problem undertaken."

Effects of applying commercial fertilizers to corn and cotton by different methods, C. B. WILLIAMS (*North Carolina Sta. Circ. 8 (1913), pp. 4*).—The data show an increased yield with both corn and cotton when fertilizer was applied in the furrow instead of broadcast. Fertilizer applied 3 times as deep as usual had no influence over ordinary depth with corn. With cotton the

greatest depth seemed to give larger yields when broadcasted, but had no influence when applied in the row.

Dividing the entire fertilizer application seemed to have no effect on the corn crop. On clay soils cotton yielded less when the application was divided, one-half applied at planting time and one-half July 1, but on fine sandy soil the reverse was noted.

"At the experiment station [clay soil] and Iredell farms [sandy clay soil] with cotton the best results were secured by using dried blood or cotton-seed meal and applying it all at planting in the row with the carriers of phosphoric acid and potash. At the Edgecombe farm [fine sandy loam] the highest yield of seed cotton on an average was secured where half of the nitrogen as dried blood was supplied in the row at planting with the phosphoric acid and potash and the remaining half of the nitrogen application reserved and made as a side dressing in the form of nitrate of soda about July 1. With corn at the Edgecombe farm, dividing the blood application and applying half with the other materials in the row at the planting of the corn and adding the other half as a side dressing about July 1 produced better results than applying all the blood at planting, or half of the nitrogen as blood at planting and the other half as nitrate of soda as a side application, or all nitrogen in the form of nitrate, half at planting with phosphoric acid and potash and the other half as a side application about the first of July. At the experiment station farm with corn, the best results were secured where half of the nitrogen as blood was applied with the potassic and phosphatic materials at planting and the other half of the nitrogen as nitrate of soda was used about July 1, and where all the nitrogen was supplied by nitrate of soda, half being applied at planting with other materials and half later as a side dressing alongside of the rows. At the Iredell farm dividing the blood application, or substituting nitrate in part or in whole for the blood and dividing the application of the nitrate of soda, did not produce as large yield as was secured where all the nitrogen as blood was applied with the phosphoric acid and potash at planting, or where the whole application—blood being the carrier of nitrogen—was divided, half being applied at planting in the row and the other half being put on as a side-dressing about the first of July."

The advisability of applying the entire fertilizer application at planting time on close texture soils is noted, while it may be divided, especially the nitrogen, on open soils and the first application made in an organic form and the second in a mineral form.

Effects of different fertilizing materials upon the maturity of cotton. C. B. Williams (*North Carolina Sta. Circ. 12 (1914), pp. 4*).—The effect of different carriers of phosphoric acid on the maturity of the cotton crop is noted as follows: With acid phosphate added to an application consisting of manure salt and dried blood, there was almost 13 per cent increase in seed cotton open of total crop at the first picking and more than 7 per cent increase at the end of the second picking. This application also gave 22 per cent more open at the first picking and 12 per cent at the end of the second picking than was secured from the no-fertilizer plat. Basic slag was found to hasten maturity even more than acid phosphate, as practically one-half of the cotton was open at the first picking on the plat which received this material in connection with manure salt and dried blood. This was about 12.5 per cent more than with acid phosphate. When this latter material was applied in the drill in connection with a ton of stable manure per acre, the effects upon hastening maturity were markedly reduced. Where high-grade finely ground phosphate rock was used at the rate of 274 lbs. per acre in connection with a ton of stable manure,

and both were applied in the drill, the percentage of total seed cotton opened at the first picking was about 35 per cent and at the end of the second more than 20 per cent greater than on an unfertilized plat adjacent.

As to the effect of different carriers of nitrogen when 78 lbs. of high-grade dried blood was added to acid phosphate and manure salt, the percentage of total crop open at the first picking was increased 3.3 per cent. Where one-half the blood was replaced an equivalent of nitrate of soda, used as a side dressing and applied early in July, the percentage of total crop open at the first picking was generally greater. When one-fifth of the nitrogen was derived from nitrate of soda and the remaining four-fifths from dried blood there was a rather marked increase in the percentage of total crop open at the first picking. When the nitrogen was derived from blood, one-half of which was applied at planting and the remainder as a side dressing, early in July, a larger percentage of total crop opened at the first picking than where nitrate of soda was divided and applied in the same way. With cotton seed applied in the drill at planting, the effect upon maturity was about the same with dried blood; while with stable manure there was a material increase in the percentage of total crop open at the first picking, but no difference at the second picking.

In regard to potash it is noted that as its proportion increased the percentage of total crop opened at the first picking gradually diminished, except for the year 1907, August of which had about 3 in. less rainfall than was normal.

For the types of soil studied, increasing from 200 to 800 or 1,200 lbs., the amount of the application per acre of a fertilizer analyzing 7 per cent available phosphoric acid, 2½ per cent nitrogen, and 2½ per cent potash, was accompanied generally by an increased percentage of the seed cotton open at the first picking.

The following tentative deductions are made relative to the influence of fertilizer upon the growth of cotton: "(1) Fertilization with ordinary applications of commercial fertilizers hastens maturity. (2) Sandy and sandy loam soils, whether fertilized or unfertilized, yield larger percentages of total cotton open at the first 2 pickings combined than do red clay soils. (3) Heavy phosphoric acid ($N\text{-}P_3\text{-}K$) fertilization on sandy and sandy loam soils, and medium heavy ($N\text{-}P_2\text{-}K$) applications of phosphoric acid from basic slag, have produced the largest percentages of total seed cotton open at the first picking. (4) Normal (N-P-K) fertilization yields on both sandy and red clay soils a larger percentage open at the first picking than high nitrogen ($N_3\text{-}P\text{-}K$) applications. (5) High nitrogen ($N_3\text{-}P\text{-}K$) applications generally yield on all types of soil studied larger percentages of total yield open at the first picking than high potash ($N\text{-}P\text{-}K_3$) applications. (6) Air-slaked lime alone does not hasten maturity, but when used in connection with commercial fertilizer it augments their influence in hastening maturity."

Local fertilizer experiments with cotton in northern Alabama in 1913, J. F. Duggar, J. T. Williamson, and L. J. Hawley (*Alabama Col. Sta. Bul. 175 (1914), pp. 3–47*).—"This bulletin records the results of 32 fertilizer experiments with cotton conducted by the Alabama Experiment Station in the counties of the northern half of Alabama in 1913. Of these, 21 are regarded as conclusive.

In 17 of the conclusive experiments cotton-seed meal was apparently needed and profitable. In 12 experiments, phosphate was more effective than kainit; in 3 it was about equally as important as kainit; and in 2 tests, it was less effective than kainit, though apparently needed. Kainit was apparently needed to a greater or less extent in 16 tests.

"As a rule, the complete fertilizers were more profitable than cotton-seed meal, acid phosphate, or kainit applied singly or in pairs. The complete fertilizers were also the most profitable applications in 1911 and 1912 in north Alabama. In the general average it was more effective and more profitable in all

3 years to apply 100 lbs. of kainit in a complete fertilizer than to use 200 lbs. of kainit. The average of the conclusive experiments shows that in 1913 in north Alabama 100 lbs. of nitrate of soda applied after the plants were 6 in. high was more effective and profitable than was 200 lbs. of cotton-seed meal applied before planting."

Method of improving cotton by seed selection, R. Y. WINTERS (*North Carolina Sta. Circ. 3 (1913), pp. 4, fig. 1*).—Methods of selection through the third year in the plant-to-row system of crop improvement with cotton are given.

Buying cotton seed for planting, R. Y. WINTERS (*North Carolina Sta. Circ. 14 (1914), pp. 2*).—Cautions to buyers and suggestions for the home growing of cotton seed are given.

Long staple cotton in North Carolina, C. B. WILLIAMS (*North Carolina Sta. Circ. 13 (1914), pp. 3*).—Statistical notes are given with suggestions for growing and ginning upland long-staple varieties.

Growing Egyptian cotton in the Salt River Valley, Arizona, E. W. HUDSON (*U. S. Dept. Agr., Farmers' Bul. 577 (1914), pp. 8*).—In order to foster the cultivation of Egyptian cotton for the production of large yields of uniformly long and strong fiber this publication describes methods of preparing the land and irrigating and cultivating the crop which have proved successful in the Salt River Valley. The subjects taken up include selection, slope, and early preparation of land, preparation of the seed bed, planting, early cultivation, early irrigation, thinning, late cultivation, late irrigation, picking, ginning, and baling.

Cotton in the Dominican Republic (*Bul. Pan Amer. Union, 37 (1913), No. 5, pp. 677–680, figs. 2*).—This describes the methods of cultivation employed in a successful attempt to cultivate cotton under irrigation in the Yaque Valley, near Monte Cristi. The product of 350 acres is noted as being "extremely long, fine, and strong, averaging very even, and is graded as 1⅜-in. staple."

A comparative study of the composition of hops grown in different parts of the world, H. V. TARTAR and B. PILKINGTON (*Jour. Indus. and Engin. Chem., 5 (1913), No. 6, pp. 478–480*).—Previously noted from another source (E. S. R., 29, p. 534).

Species and varieties of malangas cultivated in Cuba, J. T. ROIG Y MESA ET AL. (*Estac. Expt. Agron. Cuba Bol. 21 (1913), pp. 26, pls. 11*).—This describes 11 varieties of Xanthosoma and Colocasia, with their chemical analyses and methods of cultivation.

The influences of subsoiling on yield, AUGSTIN (*Illus. Landw. Ztg., 33 (1913), No. 32, pp. 303, 304, figs. 2*).—Oats showed an increased yield of both straw and grain when the land was subsoiled to a depth of from 24 to 27.5 cm. (9.4 to 11.7 in.).

Notes on the culture of peanuts, E. LEPLAE (*Bul. Agr. Congo Belge, 4 (1913), No. 3, pp. 610–627, figs. 4*).—This gives notes on the peanut industry in the Belgian Kongo district and describes methods of cultivation in practice there.

Fertilizer experiments with potatoes, CLAUSEN (*Illus. Landw. Ztg., 33 (1913), No. 18, pp. 164–166, fig. 1*).—Results here noted give relative yields as follows: With complete fertilizer 100, without nitrogen 44, without phosphorus 76, without potash 67, with complete fertilizer plus lime 80, and without fertilizer 39.

In another experiment the peculiar influence of a deficiency of potash in the presence of lime-nitrogen and Thomas slag is noted. The relative yields were complete fertilizer 100, without nitrogen 76.4, without phosphorus 69.4, without potash 36, and unfertilized 41.5. The small yield without the potash is explained as a result of a physical action of the lime nitrogen and Thomas slag on the soil, which was of a light sandy nature.

Experimental study on varieties of potatoes for the periods 1910–11 and 1911–12, A. C. TONNELIER (*Buenos Aires: Min. Agr., 1913, pp. 147, figs. 147*).—Notes on about 500 varieties of potatoes include methods of cultivation, rainfall, and yield per hectare which ranged from 120 to 43,480 kg. This work was done at the experiment station.

Notes on potato growing (*Queensland Agr. Jour., 31 (1913), No. 6, pp. 343–348*).—There was an average gain of 2 tons, 5 cwt. of tubers per acre when the seed potates were allowed to sprout before planting. Certainty of a perfect stand by this method is noted as the chief gain factor. The heaviest yields were secured when the sets were planted 1½ ft. apart, in rows 3 ft. apart. Earthing up in rows running north and south gave an increase in yield of about 2 tons over earthing up in rows running east and west when potatoes were planted 3 ft. apart each way.

[Experiments with rape], BIELER (*Illus. Landw. Ztg., 33 (1913), No. 90, p. 815*).—This paper reports results of variety tests of rape for the years 1906, 1908, 1910, and 1911 and notes a correlation between rainfall and vegetation period of rape as follows: 238 mm. and 48 days, 196 mm. and 39 days, 208 mm. and 57 days, and 123 mm. and 39 days.

In a culture experiment soil preparation by plowing 8 in. and subsoiling 12 in. deep gave a greater yield of rape seed, while plowing to the deph of 14 in. without subsoiling gave larger yields of straw than other methods, including plowing to the depth of 8 in. without subsoiling.

Production of rape seed near Shanghai, A. P. WILDER (*Daily Cons. and Trade Rpts. [U. S.], 16 (1913), No. 300, p. 1435*).—This notes the production of rape seed in the Loongwah district, China, where yields reach 1,600 lbs. per acre. The manufacture of oil is also noted.

The cultivation of rice in Uruguay, T. KESSISSOGLOU (*Rev. Min. Indus. Uruguay, 1 (1913), No. 5, pp. 45–112, figs. 42*).—Aside from methods of cultivation employed in Uruguay this gives botanical characteristics, history and classification of rice, and some notes on results of variety and cultural tests at the National Institute of Agronomy at Montevideo, between October, 1912, and April, 1913.

The composition of sugar beets grown in the northern counties, S. H. COLLINS and A. A. HALL (*Jour. Soc. Chem. Indus., 32 (1913), No. 19, pp. 929–931*).—The tabulated results of analyses of the sugar-beet crops of 1911–12 under various manurial treatments are given. The sugar content ranged from 12.45 to 16.85 per cent.

Sugar-beet seeds, SCHRIBAUX (*Bul. Soc. Agr. France, 1913, May 1, pp. 322–326*).—This paper discusses methods of placing valuations on beet seeds of different sizes based on germination tests. A scale of seed weights and germinative ability, based upon the author's experiments, is presented.

Sugar beet seeds, M. A. DEMOLON (*Bul. Soc. Agr. France, 1913, May 1, pp. 326–328*).—In studying the influence of the size of beet seeds on the product very small (100 balls=0.4 gm.), small (100 balls=0.8 gm.), medium (100 balls=1.6 gm.), and large seeds (100 balls=2.22 gm.) yielded 354, 330, 390, and 371 gm., respectively.

Experiments in selection of sugar cane, A. H. ROSENFELD and T. C. BARBER (*Rev. Indus. y Agr. Tucumán, 4 (1913), No. 5, pp. 200–204*).—The average results of 3 years' work of selection gave a yield of 48,378 kg. per hectare as compared with 39,732 kg. for unselected canes.

Experiments on thinning sugar cane in the row, A. H. ROSENFELD and J. A. HALL (*Rev. Indus. y Agr. Tucumán, 4 (1913), No. 4, pp. 150–152*).—The results showed a yield of 41,653 kg. per hectare without thinning as compared with 38,326 kg. for the thinned area.

Mutation in tobacco, H. K. HAYES and E. G. BEINHART (*Science, n. ser., 39 (1914), No. 992, pp. 34, 35*).—This paper notes the appearance of a new type of tobacco plant, discovered in a crop of "Cuban" tobacco in Connecticut that had been selfed for five generations. The new type occurred in about one in a million from the 1910 seed crop and bore from 62 to 80 leaves per plant, about 50 per cent more than the normal type, and thus far has bred true, thus indicating that mutation must have taken place after fertilization.

The inheritance of certain characters of beets and turnips.—II, Turnips, B. KAJANUS (*Ztschr. Pflanzenzücht., 1 (1913), No. 4, pp. 419–463, pls. 3, figs. 2*).—This continues work previously noted (E. S. R., 29, p. 832).

From the results of crossing turnips of different colored flesh, of different shape of roots, and of different leaf characters of several species, the author concludes that form is a constant factor; that violet red color (anthocyanin) is either stabile or labile; that dark red is dominant over light red or colorless; that there are two types of green color, one of chlorophyll origin at the root crown, and the other a greenish tint accompaning the yellow topped roots; that the color of the yellow topped turnips is recessive with green and red; that the yellow flesh color is recessive with the white flesh; that the orange-yellow flower color and yellow flesh, and lemon-yellow flower color and white flesh, are correlated; that smooth and hairy characters of the leaves form a Mendelian pair; and that the side tubercules on the roots of the hybrids are probably due to bacteria infection.

Hairy vetch, C. B. WILLIAMS (*North Carolina Sta. Circ. 10 (1913), pp. 5, fig. 1*).—Cultural notes, together with comments on its use for soil improvement, pasturage, and food value, are given.

Notes on wheat, J. CASCÓN (*Bol. Agr. Téc. y Econ. 5 (1913), No. 59, pp. 1013–1024*).—A study of the effect of climatic factors on the yield and baking qualities of wheat showed that the rainfall was very important in connection with clean cultivation and the use of nitrate of soda as a fertilizer.

The methods employed in testing grass seeds, G. H. PETHYBRIDGE (*Jour. Econ. Biol., 7 (1912), No. 2, pp. 41–49, fig. 1*).—The author believes that the method used by the Irish Seed-Testing Station, in which the seed containing no caryopsis is not counted as an impurity, gives nearer the correct value of the seed sample than the method used on the Continent that attempts to discard the empty seeds and bases the germination test on the full seeds only.

Shall seed be tested in artificial media or in soil? L. HILTNER (*Prakt. Bl. Pflanzenbau u. Schutz, n. ser., 11 (1913), Nos. 7, pp. 85–91; 8, pp. 104–106*).—From a review of investigations on the subject the author concludes that brick dust is the most practical medium for seed-testing stations, but that the ideal way would be to use soil from each field where the seed is destined to be planted in order to determine the true agricultural value.

Germination tests, G. H. TRUE ET AL. (*Nevada Sta. Rpt. 1913, pp. 23, 24*).—Results of testing seed for growers, dealers, and farmers in the State led to the conclusion "that the presence of either brown or green seeds lessens the value of [alfalfa] seed from a commercial standpoint. Our many tests of western-grown alfalfa seed have shown that in practically all samples there is quite a large percentage of hard seeds that will not germinate in even 28 days. Dry-farm alfalfa seed contains a larger percentage of hard seeds."

Seed inspection (*Maine Sta. Off. Insp. 52 (1913), pp. 93–104*).—This publication gives the chief requirements of the Maine seed law, discusses the seed industry in the State, and gives results of inspecting 1,211 samples of seeds during 1913.

Culture and weed extermination experiments at Warsaw in 1912, K. STÖRMER (*Deut. Landw. Presse, 40 (1913), No. 37, pp. 445, 446*).—The best

results are reported to have been obtained by the use of a ridging implement with oats and barley as compared with harrowing or hand cultivating.

Spraying with a 25 per cent solution of iron sulphate when wild mustard had put out its third leaf proved destructive to it in a field of oats.

On the castration of plants, E. HECKEL (*Rev. Sci. [Paris], 51 (1913), I, No. 8, pp. 225–228*).—The author reports increases in the sugar content of sorghum and maize plants, in some cases as much as 135 per cent, after complete or partial castration by removing both male and female organs or only the female organs.

Under what conditions is the theory of probabilities applicable in agricultural experiments? B. BAULE (*Fühling's Landw. Ztg., 62 (1913), No. 5, pp. 160–180, figs. 8*).—This is a mathematical discussion based upon Gauss' law of division, applied to field work.

HORTICULTURE.

A market garden and truck survey of the Ohio and Kanawha River Valleys in West Virginia, A. L. DACY (*West Virginia Sta. Bul. 143 (1914), pp. 34, figs. 13*).—The author here presents the results of a survey by himself and R. R. Jeffries of the vegetable growing industry in the Ohio and Kanawha river valleys, including also several miles of bottom lands on a number of creeks. The survey was conducted as a basis for the further study of the problems affecting the market gardening and trucking industry in the State. The data discussed deal with the extent of the industry, cultural practices, and methods of marketing.

The survey showed that vegetable growing is already of considerable magnitude in the Ohio and Kanawha River Valleys and that the average returns are much greater than those from the ordinary farm crops. While it is believed that better cultural methods would yield an increased amount of vegetables, the chief hindrance to the development of the industry appears to be a scarcity of labor to farm the land.

The home vegetable garden, T. C. JOHNSON and F. E. MILLER (*Virginia Truck Sta. Bul. 10 (1914), pp. 207–266, figs. 9*).—A practical treatise on vegetable growing with special reference to the home garden. Introductory considerations deal with the general principles of vegetable growing. Cultural details are then given for growing various kinds of vegetables, including muskmelons and watermelons, adapted for growing in Virginia.

Tomato investigations, J. G. BOYLE (*Indiana Sta. Bul. 165 (1913), popular ed., pp. 3–8, figs. 3*).—A popular summary of the bulletin previously noted (E. S. R., 29, p. 434).

Report on foreign markets for Oregon fruit and laws governing importations, S. F. LAMB (*Ann. Rpt. Oreg. State Hort. Soc., 4 (1912), Sup. [pub. 1914], pp. 89*).—A compilation of data and information secured from consular reports, showing the status of various foreign markets with reference to the utilization of fresh, dried, and canned fruits. Statistics of fruit imports of foreign countries, together with laws and regulations of foreign countries concerning American fruits, are also given.

Fruit culture and cold storage, P. BERGÉS (*An. Soc. Rural Argentina, 48 (1914), No. 1, pp. 36–53, figs. 11*).—This comprises a statistical study of the production, consumption, and commerce of fruits in Argentina, together with suggestions relative to means of extending the fruit industry in which special attention is given to the employment of precooling and refrigeration in the storage and transit of fruits.

The establishment of an apple orchard, A. J. FARLEY (*New Jersey Stas. Circ. 31, pp. 3–8*).—Practical instructions are given for the establishment and care of a young apple orchard during the first season.

Cost of an apple orchard to bearing age, M. C. BURRITT (*Rural New Yorker, 73 (1914), Nos. 4245, p. 344; 4246, p. 406; 4247, p. 468*).—The author outlines his methods of keeping records and presents data showing the cost of growing to bearing age of two particular apple orchards, one 11 years old filled one way with plums and the other 6 years old filled both ways with peaches.

He concludes from his own experience that by the use of tree fillers and intercrops an orchard at 10 years of age can be made practically selfsupporting. At the same time the opinion is advanced that on the average the net profits from orchards during their entire life time do not greatly exceed the net returns from ordinary field crops. The author calls attention to the importance of keeping accurate records of orchards for their entire life time in order to avoid false ideas of profits and to steady land values.

Apples on Long Island, P. E. NOSTRAND (*Rural New Yorker, 73 (1914), Nos. 4245, p. 341; 4246, p. 403; 4247, p. 443; 4248, p. 485*).—In this article the author briefly describes his experience in growing apples and gives notes on the character and condition of a large number of varieties tested in his orchard. In most cases twenty or more trees of each variety were planted.

The apple in Pennsylvania: Varieties, planting, and general care, J. P. STEWART (*Pennsylvania Sta. Bul. 128 (1914), pp. 109–136, figs. 11*).—This bulletin contains practical directions for the planting, care, and management of an apple orchard, including also a descriptive list of varieties adapted for planting in various sections of Pennsylvania. The subject matter is based largely on the station's experiments and observations in orcharding which have been in progress for a number of years.

Tillage and sod mulch in the Hitchings orchard, U. P. HEDRICK (*New York State Sta. Bul. 375 (1914), pp. 55–80, pls. 7*).—This is the second report on the station's comparative tests of tillage and sod mulch in apple orchard culture. The first report gave the results secured for the first five years in an orchard in the apple belt of western New York, and tillage was found to be the better treatment (E. S. R., 21, p. 238). The experiment described in the present report has been carried on for a period of ten years in the Hitchings orchard near Syracuse, which orchard has become famous because, contrary to the usual practice of tillage followed by a cover crop, the sod mulch system, commonly known as the Hitchings method, has been used with great success.

The tests were made in a level valley plat of 2-year-old trees, in a plat of 9-year-old trees on the lower part of a rolling hill, and in a plat of 10-year-old trees higher up on the hillside. In each plat half of the land was in tillage and half in sod. The tilled plats were plowed early in the spring and cultivated from seven to eleven times, a cover crop, usually of clover, following. In the sod plats was a mixed growth of orchard grass and blue grass, the grasses being mowed usually about the middle of June and left as they fell to form the "sod mulch." All plats were given identical care except as to the above soil treatment.

The young orchard matured so slowly that no yield data were secured. In the bearing sections the trees in sod bore an average of a little less than 4 bu. per tree per year, or about 4/5 bu. per tree more than the trees under tillage. Year in and year out there was little difference in size between the apples in the two sections. In the young orchard the trees grew somewhat better and more uniformly on the tilled plat, while in the bearing sections the trees appeared to thrive as well under either method of culture. The cost of tillage ranged from $11.22 per acre on the level plat to $24.33 per acre on the rough

hill plat, or an average of $16.28 per acre for tilling the 3 plats, whereas mowing on the 3 sod plats averaged only 72 cts. per acre.

No analyses were made of the soil in these plats at the beginning of the experiment, but analyses made at the end of the 10-year period indicate that tillage has tended to deplete the soil of humus and nitrogen more than is good for apple land. These results, combined with the author's observations in recent years, led to the conclusion that cover crops alone in many cases are not sufficient to supply tilled orchards with humus and nitrogen, and that the deficiency must be made up by an occasional application of stable manure, or by occasionally keeping the orchard in clover sod for a season.

The author attributes the superiority of the sod-mulch method in the hill sections of the Hitchings orchard to the existence of a deep soil and hillside seepage which furnishes an abundance of moisture for both trees and grass. Summing up these investigations as a whole tillage is believed to be unquestionably the best method of caring for the majority of the apple orchards in New York. On the other hand, the Hitchings method of sod-mulching apple trees may be used advantageously in steep hillside orchards inclined to wash badly under tillage, on land which is too rocky to be readily tilled, on soils having considerable depth and retentive of moisture, and under certain economic conditions under which it seems desirable to make a larger acreage in sod counterbalance a greater productiveness under tillage, thereby bringing the net income to the same level.

Sod mulch sometimes a success, F. H. HALL (*New York State Sta. Bul. 375 (1914), popular ed., pp. 3–8*).—A popular edition of the above.

Ten years' profits from an apple orchard, U. P. HEDRICK (*New York State Sta. Bul. 376 (1914), pp. 81–90, pl. 1*).—The author here presents data on the cost of various operations, yields, and selling prices for a period of 10 years for an orchard in which the station has carried on a comparative test of sod mulch and tillage (E. S. R., 21, p. 238). The data, as far as possible, are given for three units, the barrel of apples, the tree, and the acre.

Summarizing the results for the whole period, the average annual yield of the orchard has been 79.2 bbl. of firsts and seconds per acre and 37.6 bbl. of culls or cider stock per acre. The firsts and seconds cost $1.29 to produce and sold for $2.60, leaving a profit of $1.31 per barrel or $103.49 per acre. There was a loss of $7.89 per acre on the culls, making the average net profit per acre $95.60. The author points out that the cost of production is somewhat high, since the State can not do work as cheaply as an individual. On the other hand, the extra cost has been offset by the good condition of the orchard at the end of the experiment. It is believed that the profits are much greater than those from the average plantation in New York.

Wholesale prices of apples and receipts of apples in New York City for twenty years, H. B. KNAPP (*New York Cornell Sta. Circ. 22 (1914), pp. 13–19*).—This comprises a statistical study of receipts and wholesale prices of apples during the 20-year period 1893–1913. The receipts are shown for each year and month. The average prices are given by years and months and also the average prices of different varieties of apples. A comparison is made of the rise in price with the changes in price of other products.

In the last 10 years apples show an increase in price of 9½ per cent as compared with the previous 10 years. In the same period the price of cotton has increased 64 per cent, corn 42 per cent, hay 33 per cent, oats 38 per cent, potatoes 28 per cent, and wheat 37 per cent.

Our best German varieties of fruits.—I, Apples (*Unsere besten deutschen Obstsorten. Band I: Aepfel. Wiesbaden [1914], pp. 47, pls. 41*).—This is the first of a 3-volume series describing the more important orchard fruits of Ger-

many. The present volume contains color plates of 41 varieties of apples, each plate being accompanied by a detailed description of the tree and fruit and information relative to its adaptability to soil and climate, productivity, ripening period, etc.

On the breeding of wine grapes, DERN (*Beitr. Pflanzenzucht, No. 4 (1914), pp. 37–57*).—In this paper the author shows in a general way what has been accomplished in the improvement of wine grapes by means of selection alone, points out many difficulties which will be met in the attempt to improve grapes by breeding, and outlines some of the principal points which the breeder should have in mind in improving wine grapes.

The effects of frost on grafted vines in the Vaudois vineyards, H. FAES and F. PORCHET (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 35 (1914), No. 13, pp. 391–397*).—In order to obtain some light on the opinion expressed in many sections that European grapes grafted on American vines are more resistant to frost conditions, the authors made observations on a number of varieties, both grafted and ungrafted, in Vaudois vineyards after the spring frosts in 1913. From the data secured they conclude that the seeming superiority of the grafted vines is due to their young age as compared with the ungrafted vines rather than to any greater natural resistance to frost.

On the grafting of wine grapes, J. BERNATSKY (*Jahresber. Ver. Angew. Bot., 11 (1913), pt. 1, pp. 60–79*).—The author here calls attention to the failures which have frequently resulted in the attempt to reconstitute European vineyards by grafting on American stocks and discusses in detail the selection of stocks and scions, the principles of grafting, nursery practices, and planting operations with special reference to the successful reconstitution of vineyards.

Report on the wine and fruit industries of Argentina, MACKIE (*Diplo. and Cons. Rpts. [London], Misc. Ser., No. 687 (1914), pp. 22*).—A general survey of the wine and fruit industries of Argentina, prepared under the direction of the British consular service.

A résumé of investigations on the genus Rubus, B. LIDFORSS (*Ztschr. Induktive Abstam. u. Vererbungslehre, 12 (1914), No. 1, pp. 1–13*).—This comprises a posthumous manuscript by the author and here presented by W. Johannsen dealing with his hybridization experiments with the genus Rubus.

[Strawberries and tomatoes at Wisley, 1913] (*Jour. Roy. Hort. Soc. [London], 39 (1913), No. 2, pp. 401–414*).—Descriptive notes are given on 76 varieties of strawberries and some 90 varieties of tomatoes tested at the Wisley Gardens in 1913.

Tropical and subtropical fruits in California, F. W. POPENOE (*Jour. Roy. Hort. Soc. [London], 39 (1913), No. 2, pp. 330–337, pls. 5*).—This comprises horticultural notes on those tropical and subtropical fruits in California which have become so well established as to be offered by the trade. An additional list is given of fruits and plants many of which have not as yet passed beyond the experimental stage.

The atemoya, a new fruit for the Tropics, P. J. WESTER (*Philippine Agr. Rev. [English Ed.], 7 (1914), No. 2, pp. 70–72, pl. 1*).—As a result of his pollination experiments with Annonas (E. S. R., 24, p. 341) the author secured a number of hybrid forms one of which, a cross between the sugar apple (*Annona squamosa*) and the cherimoya (*A. cherimola*), has fruited for the first time. This fruit, which has been given the name atemoya, is practically identical with the prominent carpelled cherimoyas and appears to combine to a certain degree the adaptability of the sugar apple to grow well in low altitudes near the equator with the excellent flavor of the subtropical cherimoya which does not succeed well in such situations.

Banana culture, O. W. BARRETT (*Philippine Agr. Rev. [English Ed.]*, 7 (*1914*), *No. 2, pp. 58–64, pl. 1*).—This circular comprises a brief practical treatise on banana culture with special reference to Philippine conditions.

Practical cacao planting in Grenada, W. M. MALINS-SMITH (*West India Com. Circ., 28 (1913), Nos. 379, pp. 153–155; 380, pp. 175–177, figs. 2; 381, pp. 198–200, fig. 1; 382, pp. 225, 226, fig. 1; 383, p. 246; 384, pp. 270, 271; 385, pp. 293–296; 386, pp. 317, 318; 387, pp. 343–345; 388, pp. 365–367; 389, pp. 393, 394, fig. 1; 390, pp. 416–419; 391, pp. 438–440; 392, pp. 461–463; 393, pp. 484–487; 394, pp. 508–510; 395, pp. 533–536; 396, pp. 557–560, pl. 1, figs. 3*).—A series of articles comprising as a whole a treatise on cacao planting and cultivation with special reference to conditions in Grenada.

Cultivation of the coconut palm in Burma, A. M. SAWYER (*Dept. Agr. Burma Bul. 11 (1914), pp. 9, pls. 7*).—A brief practical treatise on the establishment, care, and maintenance of a coconut plantation.

Hybridity and hybridization among edible citrus, L. TRABUT (*Jour. Agr. Trop., 14 (1914), No. 153, pp. 65–69*).—The author calls attention to various natural variations and artificial crosses which occur among citrus fruits, points out the stability and superiority of certain hybrid forms, and suggests the utilization of hybridization for the improvement of orange groves.

The world's production and commerce in citrus fruits and their by-products, F. O. WALLSCHLAEGER (*Citrus Protect. League Cal. Bul. 11 (1914), pp. 3+95+7*).—This comprises a statistical account of the production and commerce in citrus fruits and their by-products for the various citrus producing regions of the world. The subject matter is based upon data collected by various branches of the United States Government, together with data and information which has accumulated in the office of the California Citrus Protective League.

The citrus fruit crop of the world is equal to about 100,000,000 boxes or 250,000 carloads of California size. The five most important countries in the order of their production are the United States, Spain, Italy, Japan, and Palestine. The United States and Spain each produce approximately 30 per cent and Italy 25 per cent of the total crop.

The kumquat (Citrus japonica), TRABUT (*Bul. Sci. Pharmacol., 21 (1914), No. 3, pp. 129–137, figs. 4*).—A monograph on the kumquat with reference to its botany, distribution, varieties, and culture.

Notes on Siamese pomelos, H. H. BOYLE (*Philippine Agr. Rev. [English Ed.]*, 7 (*1914*), *No. 2, pp. 65–69, pls. 5*).—This comprises horticultural notes on pomelos and some other fruits observed during a visit to the seedless pomelo plantations of Siam.

Tulips, J. JACOB (*London and Edinburgh, [1912], pp. XI+116, pls. 8*).—A popular manual of tulip culture both under glass and in the open, including information with reference to propagating and breeding tulips, diseases, and selection of varieties. Some of the principal incidents in the history of tulips commencing with the year 1554, including bibliographic references, are also given.

Violas at Wisley, 1913 (*Jour. Roy. Hort. Soc. [London], 39 (1913), No. 2, pp. 381–400*).—Brief descriptive notes are given of some 276 varieties of violas and pansies tested at the Wisley Gardens in 1913.

The "Illinois way" of beautifying the farm, W. MILLER (*Illinois Sta. Circ. 170 (1914), pp. 36, figs. 113*).—This circular treats of beautifying the farm by the judicious selection and arrangement of shrubs, flowers, vines, and trees. Special attention is directed to the utilization of trees and shrubs that grow wild in Illinois. Consideration is given to plantings for windbreaks, screening unsightly objects, creating desirable views from the house, foundation

plantings, lawn borders and shrubbery, flower gardens, and borders of native plants. A plea is made for the establishment of permanent country homes with surroundings in which the local color shall be restored and preserved.

The text is fully illustrated and lists are given of plants for special needs.

Insecticide and fungicide inspection (*Maine Sta. Off. Insp. 54 (1913), pp 141–148*).—Analyses are reported of insecticides and fungicides examined by the station during the year. They include samples of arsenate of lead, Paris green, arsenite of zinc paste, Bordeaux mixture, lime-sulphur solutions, water soluble arsenical compounds, and miscellaneous insecticides.

FORESTRY.

A handbook of forestry, W. F. A. Hudson (*Watford, England, [1913], pp. 82, figs. 25*).—A short treatise on the general principles of practical forestry with special reference to English estates. The work is intended primarily for the general estate manager, whose duties usually include the care and management of woodland.

The cultivation of osiers and willows (*Bd. Agr. and Fisheries [London], Misc. Pubs. 18 (1913), pp. 33, pls. 6*).—A popular cultural treatise including also information relative to varieties and the preparation of willows for market.

The intensive management of high mountain forests, A. Kubelka (*Die intensive Bewirtschaftung der Hochgebirgsforste. Vienna and Leipsic, 1912, pp. VIII+86*).—A treatise on forest management in high mountain regions in which special consideration is given to the application of Wagner's principles of spacial arrangement in forests (E. S. R., 20, p. 645) to this type of forestry.

Other important phases discussed include the development of a permanent system of log roads, the preparation and execution of working plans, various systems of working, and silvicultural practices.

The forests of the western Caucasus, E. A. Rübel (*Jour. Ecology, 2 (1914), No. 1, pp. 39–42, pls. 3*).—This comprises a brief phytogeographical sketch of the forests of the western portion of the Caucasus range.

DISEASES OF PLANTS.

International collaboration looking to control of pests and diseases of plants, J. Ritzema Bos (*Tijdschr. Plantenziekten, 19 (1913), No. 6, pp. 153–235*).—This is a general review of plant pests and diseases, losses therefrom, and means in use or available for control thereof, in various countries or regions, and urging international cooperation to that end.

Report on plant diseases in Ohio for 1912, A. D. Selby (*Ohio State Hort. Soc. Ann. Rpt., 46 (1913), pp. 100–110*).—According to the author, the year 1912 was characterized by low temperatures during the winter months, followed by a cold belated spring. The effect of low temperatures and winter injury to trees and shrubs is described at length, after which brief notes are given on the fungus diseases reported upon the principal horticultural, vegetable, and field crops of the State.

Mycological notes, A. C. Tunstall (*Indian Tea Assoc., Sci. Dept. Quart. Jour., 1913, No. 4, pp. 108, 109*).—The author describes the sleeping disease of tomato due to *Fusarium lycopersici*, which has made its appearance in India, and also gives an account of some investigations on red rust. It was found that fruiting bodies of *Stilbum nanum* resemble those of the alga *Cephaleuros mycoidea*, but they have no connection with the true red rust of tea.

Plant sanitation in Malaya (*India-Rubber Jour., 47 (1914), No. 7, pp. 19, 20*).—The text of the enactment of 1913 for the protection of trees, plants, and cultivated products in the Federated Malay States is given.

Soil alkalinity and plant chlorosis, J. Crochetelle (*Jour. Agr. Prat., n. ser., 26 (1913), Nos. 47, pp. 657, 658; 49, pp. 725–727*).—Results of experiments in heavy liming of sandy soil bearing colza are held to show that the assimilation of phosphoric acid is hindered by the presence of much lime, and that this latter condition is in causal relation with chlorosis on alkaline soils.

Biological treatment of diseases in plants, C. von Tubeuf (*Naturw. Ztschr. Forst u. Landw., 12 (1914), No. 1, pp. 11–19*).—*Pinus lambertiana*, already infected with blister rust (*Cronartium ribicolum*), was dusted with conidia of *Tuberculina maxima* late in May, 1913. Early in November the latter fungus was found to have developed considerably and to have dusted with conidia the neighboring pustules of the former. Observations are to be continued with the hope that *T. maxima* may prove able to weaken and check *C. ribicolum* at least on the larger pines.

A bibliography is appended.

Chemical means for combating pests of agricultural plants, E. Molz (*Fühling's Landw. Ztg., 62 (1913), No. 23, pp. 822–838*).—This is a general review of numerous chemical preparations and their employment and value as protection against vegetable or animal parasites during recent years, as reported by various investigators.

Some factors influencing the efficiency of Bordeaux mixture, L. A. Hawkins (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 35 (1914), Nos. 3, pp. 72–78; 5, pp. 142–146; 7, pp. 210–215*).—The substance of this article has already been noted from another source (E. S. R., 28, p. 537).

Resistance of grains to parasitic fungi, N. Vavilov (*Trudy Selekts. Stantsii Moskov. Selsk. Khoz. Inst. (Arb. Vers. Stat. Pflanzenzüch. Mosk. Landw. Inst.), 1 (1913), No. 1, pp. 1–108, pls. 3*).—This is an account of studies regarding susceptibility of wheat and oat varieties to fungus attack; also regarding the relation of their disease resistance to structure and environment and the value of these characters as criteria for classification. The results are given in considerable detail.

Parasitic injury to winter grains, K. Störmer and R. Kleine (*Illus. Landw. Ztg., 33 (1913), No. 31, pp. 296–298, fig. 1*).—This is substantially the same as an article previously noted (E. S. R., 29, p. 446). In that notice, the strength of the corrosive sublimate solution recommended, which was by mistake given as 0.001 per cent, should have been given as 0.1 per cent, or 1 : 1000.

Smut protection and the influence of cropping time on output and health of crop, H. C. Müller, E. Molz, and O. Morgenthaler (*Landw. Vers. Stat., 83 (1913), No. 3–4, pp. 211–220*).—Giving tabulated results of studies on summer wheat and barley, the authors show that late planting decreased the attack of Helminthosporium on barley, but increased that of loose smut on wheat; and that attack on the latter grain by the wheat fly (*Chlorops taeniopus*) was enormously increased by planting a few weeks later. It is stated also that later planting of summer wheat decreased sensibly the germinability of the resulting seed grain and that the grain from stalks infested by Chlorops showed lower germinability than did wheat from normal grains.

Studies on the biology of loose smut of barley, J. Broili and W. Schikorra (*Ber. Deut. Bot. Gesell., 31 (1913), No. 7, pp. 336–339, fig. 1*).—Pursuant to previous work of Broili (E. S. R., 24, p. 647), the authors made a study of *Ustilago hordei nuda* in embryos of grains selected from barley artificially inoculated.

Of 21 plants grown from seeds suspected to be infected 13 developed loose smut and from these the fungus was cultivated, proving to be *U. hordei nuda*. The work is being carried forward with a view to the possibility of developing a variety resistant to loose smut.

Three cases of monstrosity in maize, L. DE LA BARREDA (*Bol. Dir. Gen. Agr. [Mexico], Rev. Agr., 2 (1912), No. 9, pp. 803–808, pl. 1*).—The author gives a description and discussion of three ears of maize presenting curious anomalies of growth, two specimens showing attack by *Ustilago maydis*.

The downy mildew of maize, E. J. BUTLER (*Mem. Dept. Agr. India, Bot. Ser., 5 (1913), No. 5, pp. 275–280, pls. 2*).—The author describes a disease of maize due to *Sclerospora maydis*, which is said not to have been previously known in India. The fungus was first discovered in Java and made its appearance on the Pusa Farm in 1912. The presence of the fungus becomes apparent before the plants have attained full growth. The lower leaves are usually normal, but the upper part is chlorotic.

For the control of this disease prevention of the formation of oospores is recommended, and for this purpose the removal and destruction of all diseased plants before their wilting is advised.

Observations on the downy mildew (Sclerospora graminicola) of pearl millet and sorghum, G. S. KULKARNI (*Mem. Dept. Agr. India, Bot. Ser., 5 (1913), No. 5, pp. 268–274, pls. 2*).—According to the author this fungus is found on pearl millet, sorghum, Italian millet, and teosinte. The effect of the fungus on pearl millet and on sorghum is described at some length.

Cross-inoculations with cultures of the fungus taken from both the hosts failed to produce infection. This is believed to have been due possibly to the fact that infection occurs only at the seedling stage or that there may be biological forms of the same species. The author is led to believe, from his investigations, that the two fungi are distinct and he draws up contrasting characters for the different varieties. He states that the conidia lose their vitality after a few hours and that it is as yet unknown how the fungus passes from year to year. A test made of the seed to determine whether they might carry the fungus resulted in the production of sound plants.

Foot disease of wheat, E. ROBERT (*Jour. Agr. Prat., n. ser., 26 (1913), No. 49, pp. 715, 716*).—It is stated that foot disease of wheat is serious following a mild, moist winter, resulting in a somewhat rank vegetative growth, and that this disease is also favored by short term rotation, heavy seeding in the drill, and varietal precocity of growth.

Stalk disease of wheat, A. BOIJEAU (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 35 (1914), No. 8, pp. 242–247*).—Noting the considerably increased intensity of foot disease of wheat in 1913, the author states that certain factors appear to be influential in this connection, as mild and moist winters, incomplete soil fertility or wrong time of manuring, running the ground to wheat too constantly year after year, and bad physical condition of the soil in the spring.

Employment of later maturing varieties, as far as permitted by climatic conditions, is suggested.

Pythium debaryanum, E. J. BUTLER (*Mem. Dept. Agr. India, Bot. Ser., 5 (1913), No. 5, pp. 262–267, pl. 1*).—A description is given of this fungus, which is said to be of recent recognition in India. In the article the author describes the attack on seeds of castor beans which had been sown in unsterilized soil.

Potato diseases, E. FOEX and C. PERRET (*Vie Agr. et Rurale, 3 (1914), No. 5, pp. 129–134, figs. 2*).—This is a condensed review of recent studies reported by various authors on leaf curl, leaf roll, blackleg, etc., of potato, and their alleged causes, in connection with preventive or remedial measures tested or proposed. A bibliography is given.

Potato diseases in New Jersey, M. T. COOK and G. W. MARTIN (*New Jersey Stas. Circ. 33, pp. 24, figs. 13*).—A description is given of some of the more common diseases of potatoes, with suggestions for their control.

Leaf roll of potato, O. APPEL and O. SCHLUMBERGER (*Mitt. K. Biol. Anst. Land u. Forstw., No. 12 (1912), pp. 14, 15*).—No conclusions are drawn from the variable relations observed between weight of crop obtained and weight of tubers planted in case of seed potatoes showing leaf roll. The experiments have been continued.

Colocasia blight caused by Phytophthora colocasiæ, E. J. BUTLER and G. S. KULKARNI (*Mem. Dept. Agr. India, Bot. Ser., 5 (1913), No. 5, pp. 233–261, pls. 4*).—The authors describe a widely distributed disease of Colocasia, or taro.

The disease is said to be found practically wherever the plant is cultivated and also occurs on wild specimens in moist localities. In severe attacks all the leaves may be destroyed and the plant killed, or in milder attacks the older leaves are more or less destroyed by the fungus, in which case the corms may be entirely lacking or if any are formed they will be small and shrunken. Infection of the corm was noticed comparatively recently, while the attack on the leaves had been known for a number of years. On the corm a dry rot of rather soft texture is formed. Microscopic characters of the fungus, results of inoculation experiments, etc., are given. From the inoculation experiments it is found that Colocasia is the only representative of the family Araceæ that serves as a host for this fungus. The systematic relationship of the fungus is discussed at some length, after which suggestions are given for prevention of its attack. The means suggested include spraying, removal and destruction of spotted leaves, and selection of sound corms for planting.

The mosaic disease of the tomato and related plants, L. E. MELCHERS (*Ohio Nat., 13 (1913), No. 8, pp. 149–175, figs. 3*).—The author presents a review and bibliography of the essential literature of mosaic disease of plants and gives brief description of his investigations on the mosaic disease of tomato and potato.

The disease is said to be quite prevalent on tomatoes, especially when grown under glass, and frequently appears in Ohio on the main crops. It was noticed in February, 1913, on potatoes grown in the greenhouse, the first symptoms appearing when the plants had attained a height of approximately 18 in. The disease appeared spontaneously without pruning, mutilation, or artificial stimulation, but thus far has not been observed on potatoes growing in the field. Histological studies were made of the tissues and no characteristic abnormalities were observed on the tomato. In potato leaves sections of the mottled areas were readily distinguished by the shape and size of the palisade cells. Their length was from one-half to one-third that of normal cells and their thickness was usually somewhat increased. The spongy parenchyma was somewhat abnormal in appearance in the yellow regions which contained fewer chloroplasts.

An extended discussion is given of the characteristics of the mosaic disease on different plants, theories regarding its cause, and preventive measures.

Root knot in the tomato, H. A. WAGER (*So. African Jour. Sci., 10 (1913), No. 3, pp. 51–53, pl. 1, fig. 1*).—A description is given of a nematode disease of tomatoes, which the author believes is due to a species differing from *Heterodera radicicola* as described in the United States and elsewhere.

Preliminary report on a disease of melons and cucumbers, Z. KAMERLING (*Bul. Min. Agr., Indus. e Com. [Brazil], 2 (1913), No. 4, pp. 157–161, pls. 2*).—The author reports briefly the partial study of a cucumber and melon disorder, in connection with which *Heterodera radicicola* was noted.

Disease susceptibility of apple varieties in Ohio, A. D. SELBY (*Ohio State Hort. Soc. Ann. Rpt., 46 (1913), pp. 75–78*).—A tabular list is given of disease susceptibility in Ohio of 38 varieties of apples to crown gall, collar rot, blister canker, twig blight, scab, bitter rot, blotch, black rot of fruit and canker, fruit spot or Baldwin spot, and fungus fruit spot due to *Cylindrosporium pomi*.

Black spot canker or apple tree anthracnose, W. H. LAWRENCE (*Bien. Rpt. Bd. Hort. Oregon, 12 (1911–12), pp. 93–97*).—The author gives a description of the black spot canker due to *Glœosporium malicorticis*, the perfect form of which is *Neofabræa malicorticis*. A previous account of his investigations on this subject has been noted (E. S. R., 16, p. 790). Among the more important facts recently observed regarding it, is the occurrence of the disease on stored fruit from orchards in which anthracnose canker was not known to occur.

The author advises thorough, repeated spraying for the control of this fungus, autumn spraying following the maturing of the fruit being considered of decided advantage over later applications. The use of a Bordeaux petroleum emulsion was briefly tested and seems to be of considerable promise.

The control of apple blotch, D. E. LEWIS (*Kansas Sta. Bul. 196 (1913), pp. 517–574, figs. 21*).—An account is given of experiments for the control of the apple blotch due to *Phyllosticta solitaria*. This disease is of rather common occurrence in the orchards of Kansas, frequently causing over 90 per cent of injury to susceptible varieties.

The author states that it may be successfully controlled by the application of Bordeaux mixture the first season sprayed, and by the continued use of this fungicide during successive seasons it can be almost completely eradicated from an orchard in from four to six years. The 3:4:50 formula of Bordeaux mixture is recommended for use. Lime-sulphur solution was found less effective than Bordeaux mixture for the control of apple blotch, but during wet weather its use is recommended in place of Bordeaux mixture on account of the tendency of the latter fungicide to russet the fruit. The work of eradicating the disease can be hastened by cutting back trees and the commercial value of the fruit correspondingly increased.

The control of fire or pome blight, W. H. LAWRENCE (*Bien. Rpt. Bd. Hort. Oregon, 12 (1911–12), pp. 107–109*).—A description is given of the bacterial blight of apples and pears, and attention is called to the necessity for organized effort for its control.

Treatments for fruit tree diseases, P. PERRONNE (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 35 (1914), No. 2, pp. 57–60*).—The author details chemical and surgical treatments claimed to prove beneficial under given conditions in case of peach rust, and black spot of pear trees.

A new disease of pear, P. PASSY (*Jour. Soc. Nat. Hort. France, 4. ser., 14 (1913), May, pp. 288, 289; Rev. Hort. [Paris], 85 (1913), No. 11, pp. 252, 253*).—A description is given of a disease of pear trees which has been recognized for about a dozen years.

The cause is not definitely known, although it is believed possibly to be bacterial in its origin. The progress of the disease is shown in the checking of development of the shoots in midseason, at which time the epidermis loses its smooth appearance and takes on a purplish color, later becoming roughened. The following year the branches showing signs of the disease are purplish in color and rough, and in case of severe attack the leaves fail to develop. In some instances the cracking of the epidermis is quite marked, the slits extending to a considerable depth. As is indicated above, little is known regarding this disease, which is still under observation.

Treatment of court-noué with tar, J. BERTRAND (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 35 (1914), No. 3, pp. 80–84*).—This is mainly a favorable discus-

sion of the work and conclusions reported by Lamouroux (E. S. R., 30, p. 246) regarding treatment of grape stocks with coal tar for court-noué.

Spots characteristic of downy mildew, L. Ravaz (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 35 (1914), No. 5, p. 141, pl. 1*).—Both the yellow or so-called oil spots (often the first indication of the mildew) and the whitish patches (usually seen only on the lower surfaces of the leaves) are shown in natural color. A later discussion of the significance of each is promised.

Does Cronartium ribicola overwinter on the currant? F. C. Stewart and W. H. Rankin (*New York State Sta. Bul. 374 (1914), pp. 41–53, pls. 3, fig. 1; abs. in Phytopathology, 4 (1914), No. 1, p. 43*).—The occurrence of this fungus on currants at the New York State Station for several years led to the suspicion that possibly the fungus might winter-over on the black currant. A large number of black currant plants thoroughly infested with Cronartium were divided into six lots and sent to widely separated experiment stations for observation. No Cronartium was to be found on the new leaves and attempts at inoculation by means of infected leaves wintered in wire cages out of doors also failed. It is concluded that *C. ribicola* rarely if ever overwinters on currants.

In the same connection the authors report the finding of two 15-year-old white pines affected with *Peridermium strobi* in May, 1913. These trees have been destroyed so as to prevent the further spread of the disease.

Do dormant currant plants carry pine rust? F. H. Hall (*New York State Sta. Bul. 374 (1914), popular ed., pp. 4, fig. 1*).—A popular edition of the above.

A disease of agaves, I. H. Burkill (*Gard. Bul. Straits Settlements, 1 (1913), No. 6, pp. 193, 194*).—The author reports a disease of agaves in Singapore due to a fungus attacking the mature leaves on the upper surface, rendering them useless for the extraction of fiber. The attack, which is briefly described, is said to resemble in some respects that of a Colletotrichum, while the spores resemble those of a Coryneum.

Cutting and burning the leaves as soon as the disease is noted is recommended.

Cacao canker, J. Kuyper (*Dept. Landb. Suriname Bul. 31 (1913), pp. 29–33*).—The author reports studies on cacao canker pursuant to the work of Rorer (E. S. R., 23, p. 748), Petch (E. S. R., 25, p. 46), and Rutgers (E. S. R., 29, p. 248), in which all the stem and fruit infections made by him with a fungus claimed to be *Phytophthora faberi* produced effects characteristic of cacao canker, the control showing no such results. He has not yet succeeded in isolating this fungus from these lesions.

Citrus canker, H. E. Stevens (*Florida Sta. Bul. 122 (1914), pp. 111–118, figs. 4*).—A preliminary account is given of a new citrus disease which was first observed in the fall of 1912 and again in the spring of 1913, when leaves and twigs of grapefruit were found badly infected.

The disease in general has the same appearance on leaves, fruit, and twigs. It appears in small circular spots from one-sixteenth to one-fourth of an inch across, occurring either singly or several together. The spots are raised above the surrounding tissue, are light brown in color, and are composed of a spongy mass of dead cells covered by a thin white or gray membrane, which finally ruptures and turns outward forming a ragged margin around the spot. On the older twigs pronounced cankers are formed.

The disease at first was thought to be an unusual manifestation of scab, scaly bark, or possibly anthracnose, but it was found to differ materially from any of these. The organism causing it has not yet been determined, but it is probably due to some fungus. A number of species of fungi have been found associated with the spots and some of these are under investigation. The disease appears to be confined mainly to the grapefruit, the sweet orange

apparently not being affected. It is infectious and the climatic condition of Florida appears to favor its rapid spread. In addition to Florida it is known to occur also in Alabama and may exist in Texas.

The author recommends the careful inspection of nursery stock, the destruction by burning of small affected trees, and the pruning off and burning of all diseased parts of larger trees.

[Root diseases of lime trees in Dominica], H. A. TEMPANY (*Imp. Dept. Agr. West Indies, Rpt. Agr. Dept. Dominica, 1912–13, pp. 9–14*).—The author gives an account of investigations by F. A. South on stem canker diseases of lime trees, the black root disease due to *Rosellinia* sp., and the red root disease caused by *Spharostilbe* sp., together with suggestions for their control so far as definite means are known.

A leaf disease of papaya, A. MAUBLANC (*Bol. Min. Agr., Indus. e Com. [Brazil], 2 (1913), No. 1, pp. 126–130, pl. 1*).—This is substantially the same as an article previously noted from another source (E. S. R., 29, p. 848).

[Recent mycological tours], A. C. TUNSTALL (*Indian Tea Assoc., Sci. Dept. Quart. Jour., 1912, No. 4, pp. 105–108*).—This is a brief account of tours through several districts, noting the presence and relative importance to tea growers of *Ustulina zonata*, *Hymenochæte noxia*, *Cephaleuros virescens*, *Læstadia theæ*, and *Botryodiplodia theobromæ* in the different sections. *H. noxia* was found apparently spreading through the medium of a wooden fence along which the adjacent tea bushes were dying from this fungus.

Mycologist's notes, A. C. TUNSTALL (*Indian Tea Assoc., Sci. Dept. Quart. Jour., 1913, No. 1, pp. 30–32*).—The author reports some observations made on plant disorders while visiting several stations.

Hymenochæte noxia was the most prevalent of the root diseases of tea met with. *Ustulina zonata* was found on tea in a few gardens. Rosellinia, observed in some shady patches of tea, had apparently done harm in only one case. Blister blight of the leaves, due to *Exobasidium vexans*, was seen as early as January, the starting places showing signs of having borne a continued crop of fungus throughout the cold weather. Removal of infection centers has considerably reduced this blight. Copper blight (*Læstadia theæ*), though common, appears to do but little damage.

[Some diseases of tea], A. C. TUNSTALL (*Indian Tea Assoc., Sci. Dept. Quart. Jour., 1913, No. 4, pp. 104–106*).—A description is given of die-back due to *Gloeosporium* sp., blister blight, and canker.

The die-back, it is said, may be controlled by spraying with Bordeaux mixture. The blister blight, caused by *Exobasidium vexans*, has been studied at considerable length and no evidence has been found that it occurs on any other plant than tea. It is considered probable that the disease must pass the winter in an active state on the tea plant itself, and that thorough spraying with Bordeaux mixture or similar fungicide would probably control it. Studies on the cause of canker have failed to show how the fungus enters the plant, and thus far no definite means for killing it have been discovered.

Fungi parasitic on the tea plant in northeast India, I, A. C. TUNSTALL (*Indian Tea Assoc., Sci. Dept. Quart. Jour., 1913, No. 4, pp. 100–103*).—The author describes attacks of *Pythium debaryanum* and *Mucor mucedo* on tea plants.

[Mosquito blight of tea], P. H. CARPENTER (*Indian Tea Assoc., Sci. Dept. Quart. Jour., 1912, No. 4, pp. 104, 105*).—Reporting an inspection tour in several districts, the author notes that in Cachar the most important pest found is mosquito blight. This appeared to be worse in 1912 than for many years past. It is said to affect tea grown on a peat soil earlier and more se-

verely than on other soils. The light leaved varieties are said to appear much less susceptible to this disease than the others grown in these districts.

A note on the treatment of blister blight, A. C. TUNSTALL (*Indian Tea Assoc., Sci. Dept. Quart. Jour., 1913, No. 2, pp. 50–53*).—The author reports recent observations in Assam and Darjeeling leading to the conclusions that *Exobasidium vexans* is able to attack tea only and that the disease passes the winter in an active stage, no dormant stage or special winter form being known. Wind may carry spores for long distances, this fact requiring cooperation over wide areas. Treatments described include the application to dormant bushes of a solution composed of 2 lbs. sodium hydrate to 10 gal. water; to green bushes, one consisting of 6 lbs. each of copper sulphate and quicklime to 100 gal. water; and in rainy seasons of 2 oz. each of common salt and lime to 1 gal. water. The spraying fluid, it is said, is most economically applied from below.

Root disease of tea, A. C. TUNSTALL (*Indian Tea Assoc., Sci. Dept. Quart. Jour., 1912, No. 1, pp. 17–22*).—This is a digest of a circular by Petch, which has already been noted (E. S. R., 25, p. 47).

A root disease of tea, A. C. TUNSTALL (*Indian Tea Assoc., Sci. Dept. Quart. Jour., 1913, No. 2, pp. 54, 55*).—*Fomes lucidus* is reported to have been observed to attack tea. Recent researches are said to have shown also that this is a dangerous parasite of betel nut palm and other trees as reported by Butler (E. S. R., 29, p. 445).

Preliminary note on a disease of Basella rubra, E. RANGEL (*Bol. Min. Agr., Indus. e Com. [Brazil], 2 (1913), No. 4, pp. 177–180, pls. 2; Lavoura; Bol. Soc. Nac. Agr. [Brazil], 17 (1913), Nos. 7–8, pp. 136–140, pl. 1*).—A leaf disease of *B. rubra* was ascribed to a fungus studied and named *Stagonospora basellæ* n. sp., in association with another fungus which was named *Phyllosticta basellæ* n. sp.

Nematode studies, SCHWARTZ (*Mitt. K. Biol. Anst. Land u. Forstw., No. 12 (1912), pp. 26, 27, fig. 1*).—The author notes the discovery in lily-of-the-valley of a nematode which is described under the name *Aphelenchus aderholdi* n. sp. A second species appearing in tap water, named *A. mycogenes* n. sp., is said to be closely related to *A. olesistus*. *Tylenchus dipsaci* is reported as causing galls on phlox.

Parasitism of mistletoe, N. VAN POETEREN (*Tijdschr. Plantenziekten, 18 (1912), Nos. 5–6, pp. 101–113, pl. 1; Bul. Soc. Cent. Forest. Belg., 20 (1913), No. 12, pp. 834–844*).—A case, discussed in considerable detail, of *Viscum album* growing in a large cluster on an otherwise leafless graft terminating an apical branch of *Sorbus aucuparia*, is cited as possibly throwing some light on the actual or potential nutritive relations between parasite and host.

Witches' broom on Juniper, E. HEINRICHER (*Naturw. Ztschr. Forst u. Landw., 12 (1914), No. 1, pp. 36–39, fig. 1*).—The author states that *Arceuthobium oxycedri* easily parasitized *Juniperus communis*, producing characteristic witches' broom thereon.

A fruit rot of Hevea brasiliensis in Kamerun, L. PETERS (*Mitt. K. Biol. Anst. Land u. Forstw., No. 12 (1912), pp. 18–22*).—Reporting a fruit and seed rot of *H. brasiliensis*, the author states that along with a Phytophthora, other fungi and several bacteria are found, regarding which further studies are considered desirable.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Zoological record, D. SHARP (*Zool. Rec., 48 (1911), pp. XII+[1298]; 49 (1912), pp. XII+[1374]*).—These volumes record the zoological literature relating chiefly to the years 1911 and 1912, respectively.

The ornithofaunistic, ornithophenologic, and ornithobibliographic literature of Hungary prior to 1910 (*Aquila, 20 (1913), No. 1–4, pp. 252–330*).—The literature here listed alphabetically by authors consists of 3,090 titles.

The wanderings of animals, II. GADOW (*Cambridge [England] and New York, 1913, pp. VI+150, pls. 17; rev. in Sci. Prog. Twentieth Cent., 8 (1914), No. 31, p. 578*).—The chapters of this work deal with the history of geographical distribution, features of environment, numbers and density of species, former configurations of land and water, and distribution of selected groups. A bibliography is appended.

Introduction to the study of mimicry, A. JACOBI (*Mimikry und Verwandte Erscheinungen. Brunswick, 1913, pp. IV+216, figs. 13; rev. in Nature [London], 92 (1914), No. 2311, pp. 653–655*).—The chapters of this work relate to protective coloring, protective resemblance, warning colors, mimicry or protective imitation, the imitation of aculeate Hymenoptera or "Sphecoidie," the imitation of ants or "Myrmecoidie," the imitation of beetles, imitation among Lepidoptera, and the general characteristics of mimetic Lepidoptera.

A bibliography of 59 titles is appended. The review is by E. B. Poulton.

Observations on the relation between flower color and insects, E. M. EAST and R. W. GLASER (*Psyche, 21 (1914), No. 1, pp. 27–30*).—In experiments with 10 average plants of each of the 4 colors, white, yellow, red, and purple, it was found that 39.1 per cent of the white, 18.12 per cent of the yellow, 15.21 per cent of the red, and 16.74 per cent of the purple flowers were fertilized. The authors estimate that about 6 per cent of the pollination of colored types was made by night flyers (Sphingidæ, etc.) while during the same period these insects pollinated from 20 to 25 per cent of the white type.

Birds of Ontario in relation to agriculture, C. W. NASH (*Ontario Dept. Agr. Bul. 218 (1913), pp. 124, figs. 48*).—A revised edition of a bulletin previously noted (E. S. R., 22, p. 153).

Notes on some birds of Trinidad and Tobago, G. ST. C. FEILDEN (*Bul. Dept. Agr. Trinidad and Tobago, 13 (1914), No. 77, pp. 25–33*).—This annotated list of some of the more common birds includes economic notes.

Preliminary note on birds as carriers of the chestnut blight fungus, F. D. HEALD and R. A. STUDHALTER (*Science, n. ser., 38 (1913), No. 973, pp. 278–280*).—The results of the authors' experiments in the spring of 1913 to determine whether birds carry the spores of the blight fungus are summarized as follows: The spores of the blight fungus carried by birds are pycnospores and not ascospores; the maximum numbers are carried during the few days following rain periods; and the pycnospores carried are brushed off from either the normal or diseased bark, or both, in the movements of the birds over these surfaces.

Birds as destroyers of grasshoppers in California, H. C. BRYANT (*Auk, 31 (1914), No. 2, pp. 168–177*).—Much of the data here presented has been previously noted from another source (E. S. R., 28, p. 351).

[Insect pests in Tunis] (*Bul. Dir. Gén. Agr. Com. et Colon. Tunis, 17 (1913), No. 71, Sup., pp. 31–51, pls. 2*).—This report of studies conducted at the Tunis Agricultural Parasitology Station treats of the Hessian fly, the granary weevil, the rice weevil, the wheat bulb-fly (*Hylemyia coaretata*), and the Angoumois grain moth.

[Insect enemies of plants and animals] (*Vie Agr. et Rurale, 3 (1914), No. 14, pp. 365–391, figs. 21*).—This includes a general review of the subject by G. Guénaux (pp. 365–372), methods of combating flies by Vaillard (pp. 373–378), the employment of bacteria in destroying field mice by L. Perrier (pp. 378–382), the fumigation of plants with hydrocyanic acid by P. Marchal (pp. 383–386), the manner of combating insect enemies of plants by parasites and pred-

ators by A. Vuillet (pp. 386–389), and the insect enemies of the beet in southern France by F. Picard (pp. 390, 391).

The destruction of mosquitoes, fleas, flies, pediculi, and other insect carriers of disease, J. S. PURDY (*Rpt. Austral. Assoc. Adv. Sci., 13 (1911), pp. 662–673*).—A general discussion.

Reducing insect injury to stored corn, W. E. HINDS (*Alabama Col. Sta. Bul. 176 (1914), pp. 51–68, pls. 4*).—This bulletin describes the more important insect enemies of stored corn and means by which their injury can be prevented.

In storage tests about fifty times as many weevils were found on early corn up to midwinter as late matured corn. It was found that the value of the grain saved by husking will more than pay for the labor required. The practice of storing corn wet and salted is decidedly favorable to insect injuries. In a study of varieties weevil resistance was found to depend first upon the length and tightness of the husk covering upon the maturing ear.

The insect enemies of cotton in Africa, F. ZACHER (*Arb. K. Biol. Anst. Land u. Forstw., 9 (1913), No. 1, pp. 121–232, figs. 83*).—A discussion of the more important cotton insects, their injury, means of control, etc. A bibliography is appended. See also a previous note (E. S. R., 30, p. 752).

[Insect enemies of the peanut], A. CHEVALIER (*Jour. Agr. Trop., 13 (1913), No. 141, pp. 73–76*).—A brief discussion of the more important pests.

Animal enemies of the sugar beet in 1913, O. FALLADA (*Österr. Ungar. Ztschr. Zuckerindus. u. Landw., 43 (1914), No. 1, pp. 19–23, fig. 1*).—This is the author's annual review (E. S. R., 28, p. 352).

The insect enemies of the coco palm in the South Sea Islands, F. ZACHER (*Arb. K. Biol. Anst. Land u. Forstw., 9 (1913), No. 1, pp. 73–120, figs. 38*).—Fifty insect enemies of the coconut palm are dealt with, particular attention being given to the rhinoceros beetle (*Oryctes rhinoceros*). A bibliography of the more important literature relating to the subject is included.

[Insect enemies of the lime in the West Indies], H. A. BALLOU and F. W. SOUTH (*Imp. Dept. Agr. West Indies Pamphlet 72 (1913), pp. 39–61, figs. 13*).—The scale insects mentioned are the purple scale, the white scale or orange snow scale (*Chionaspis citri*), the green scale (*Coccus viridis*), the California red scale (*Chrysomphalus aurantii*), the West Indian red scale (*Selenaspidus articulatus*), the Florida red scale (*C. aonidum*), and the hemispherical scale. The other pests mentioned are the citrus rust mite, the bark borer *Leptostylus praemorsus*, the twig borer of limes (*Elaphidion mite*), and root borers. Remedial measures, natural enemies, internal parasites, and insecticides and their use are then briefly discussed.

White ants and fungi, T. PETCH (*Ann. Roy. Bot. Gard. Peradeniya, 5 (1913), No. 6, pp. 389–393*).—This is a discussion of the probable association of termites with *Entoloma microcarpum*.

The black termite of Ceylon (Eutermes monoceros), T. PETCH (*Ann. Roy. Bot. Gard. Peradeniya, 5 (1913), No. 6, pp. 395–420, pls. 9, figs. 2*).—A detailed account of this species including its nest, the external structure, the processional habit, food, etc.

Achaeta moria, a sisal hemp pest, KRÄNZLIN (*Pflanzer, 9 (1913), No. 11, pp. 568–570; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 2, p. 286*).—This orthopteran is reported to have injured year-old plants in plantations of *Agave rigida sisalana* by consuming the lower leaves just above the junction with the stem.

Studies of inheritance and evolution in Orthoptera, I, R. K. NABOURS (*Jour. Genetics, 3 (1914), No. 3, pp. 141–170, pl. 1, figs. 3*).—"The inheritance behavior of the color patterns in these orthopterous insects shows clearly the Mendelian

type of inheritance, and the essential result of these experiments has been the extension of this principle to a considerable number of types of a phylogenetically low group of ametabolous insects."

On two new species of Thysanoptera from the West Indies, C. B. WILLIAMS (*Jour. Econ. Biol., 8 (1913), No. 4, pp. 209–215, figs. 2*).—*Corynothrips stenopterus* and *Frankliniella melanommatus*, taken in large numbers from cassava plants at the agricultural experiment station, at Kingstown, St. Vincent, West Indies, are described as new to science.

Records and descriptions of British Thysanoptera, C. B. WILLIAMS (*Jour. Econ. Biol., 8 (1913), No. 4, pp. 216–230, figs. 3*).—The author has found the method of collecting flowers in paper bags recommended by Uzel to be of considerable value since it is possible to obtain material in this way from untrained correspondents in various parts of the country. It is stated that in this way pea thrips (*Frankliniella robusta*) were received from 24 counties in England, Wales, and Ireland.

Eurygaster integriceps and new methods of combating it by means of parasites, I. V. VASIL'EV (*Trudy Büro Ent. [St. Petersb.], 4 (1913), No. 11, pp. 81, figs. 31; abs. in Rev. Appl. Ent., 1 (1913), Ser. A, No. 11, pp. 446–450*).—Next to the Morocco locust this plant bug is the most serious pest of crops. During the last two or three decades it has caused immense devastation in Transcaucasia and Transcaspia and is also known in Caucasia. In Transcaspia its principal injury is to winter wheat, the cultivation of which predominates in that country, barley being damaged to only a small degree. A number of important parasitic enemies of this pest are discussed, including 2 tachinids and 5 proctotrupids of the genus Telenomus.

The last part of the work relates to methods of combating the pest by means of its parasites, it being pointed out that only the egg parasites have a practical importance in this respect. The experimental transportation of the egg parasite *Telenomus rassilievi* from central Asia to the government of Kharkof is described.

The periodical cicada or seventeen-year locust, H. A. GOSSARD (*Ohio Sta. Circ. 142 (1914), pp. 41–47, figs. 7*).—This circular has been prepared with a view to furnishing information on the periodical cicada, which is due to appear over most of eastern Ohio during the summer of 1914.

A catalogue of the Psyllidæ, G. AULMANN (*Psyllidarum Catalogus. Berlin, 1913, pp. 92*).—A synonymic catalogue of the Psyllidæ of the world, in which 478 species are listed.

A note on Oxyrhachys tarundus, N. C. CHATTERJEE (*Indian Forester, 40 (1914), No. 2, pp. 75–79, pls. 2*).—This membracid is reported as injuring *Albizzia lebbeck*, *A. procera*, *Acacia catechu*, and *Phyllanthus emblica* trees. Attention is called to the fact that the habits of this Oxyrhachys are very similar to those of *Cercsa bubalus*, described by Marlatt (E. S. R., 9, p. 675).

Morphology and biology of the Membracidæ of Kansas, HAZEL E. BRANCH (*Kans. Univ. Sci. Bul., 8 (1913), No. 3, pp. 75–115, pls. 17*).—This report of life history and morphological studies of the Membracidæ of Kansas includes tables for the separations of the subfamilies, tribes, genera, and species occurring in Kansas. A list of food plants and a bibliography are appended.

The obliteration of sexual reproduction in Chermes, P. MARCHAL (*IV. Conf. Internat. Génétique Paris, Compt. Rend. et Raps., 1911, pp. 488–490*).—In an article previously noted (E. S. R., 19, p. 860) the author has reported the results of his research on the life history of *Chermes pini*. In the indigenous race of this species sexual reproduction does not take place. Although large numbers of functionless females are produced, not a single male has been observed. On the other hand, the oriental race of *C. pini* possesses a normal

sexual stage. The author designates this phenomenon, in which the males are absent, as spanandry.

Since the previous account was published a very similar case of the obliteration of sexual reproduction has been observed in *C. strobi* which lives on *Pinus strobus*. A rudimentary sexual stage takes place on *Picea nigra*. Winged forms migrate in large numbers to *P. nigra* where they give rise solely to females. It is probable that in America there exists another race of *C. strobi*, in which the normal sexual stage occurs on Picea. A third type on which the sexual stage has hitherto been thought to be completely obliterated, is found in *C. picæ*. This species lives on *Abies pectinata*; it is very near *C. nusslini*, from which it is distinguished morphologically and also by the fact that sexual reproduction does not occur. The author has found that in *C. picæ* winged forms occasionally may appear. These forms do not migrate to Picea, but remain on *A. pectinata* where they produce parthenogenetic forms.

Mealy bug parasites in the Far East, H. S. SMITH (*Mo. Bul. Com. Hort. Cal., 3 (1914), No. 1, pp. 26–29*).—Previously noted from another source (E. S. R., 30, p. 753).

Appearance of Icerya purchasi and Novius cardinalis in the District of Beira Baixa (Portugal), C. MENDES (*Broteria, Ser. Zool., 11 (1913), No. 2, p. 146; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1913), No. 8, p. 1310*).—The occurrence in 1910 of a large number of fluted scales on acacias (*Acacia melanoxylon*) in Beira Baixa was followed by the appearance of the lady beetle *N. cardinalis*, and within a year all the fluted scales were destroyed by this predator.

The San José scale, the oyster shell bark louse, and the scurfy bark louse, J. S. HOUSER (*Ohio Sta. Circ. 143 (1914), pp. 49–62, figs. 11*).—Brief popular accounts of these three scale pests and directions for combating them.

On the zygotic constitution of dominant and recessive whites in the silkworm, Bombyx mori, K. TOYAMA and S. MORI (*Ztschr. Induktive Abstam. u. Vererbungslehre, 10 (1913), No. 3, pp. 233–241*).—This report of studies conducted at Tokio includes a bibliography of 15 titles.

Turnip moth larvæ injuring tobacco in Hungary, B. GROF (*Magyar Dohánynjsag, 30 (1913), No. 11, pp. 3, 4; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1913), No. 8, p. 1307*).—The larva of *Agrotis segetum* is reported to tunnel in the ground about 2 in. below the surface and destroy the roots of tobacco.

The spraying of oak trees in Richmond Park (*Entomologist, 46 (1913), No. 601, p. 195*).—This note relates to the spraying of some 400 oak trees with lead chromate for the control of defoliating caterpillars.

Beetles becoming parasites, V. L. KELLOGG (*Science, n. ser., 39 (1914), No. 1001, pp. 360, 361*).—The beetles mentioned include the beaver parasite *Platypsylla castoris*, which lives all its life both as a larva and adult on its host; *Leptinus testaceus*, which frequents the nests of field mice, shrews, and other small mammals of similar habit, and has also been taken from bumblebees' nests; *Leptinillus validus*, which occurs on beavers in the Hudson Bay region; and *Lyrosoma opaca*, a silphid found in the North Pacific about the tenanted nests of the murres.

Oak pests.—The oak twig girdler (Agrilus politus), L. CHILDS (*Mo. Bul. Com. Hort. Cal., 3 (1914), No. 3, pp. 150–155, figs. 3*).—The injury to live oak (*Quercus agrifolia*) by the oak twig girdler is said to be very conspicuous, the attacks upon the smaller twigs resulting more particularly in damage to the appearance of the tree. The author's pruning experiments in 1911–12 are said to have proved conclusively that the injury can be almost entirely eliminated by occasional cutting out of the attacked twigs in individual trees even

though there is not an entire clean up of all surrounding infestations. The cutting out and burning of infested branches should be undertaken between October 1 and April 1.

Two enemies of the American red oak, J. HOUBA (*Bul. Soc. Cent. Forest. Belg., 20 (1913), No. 4, pp. 249–255, figs. 4*).—Two enemies of *Quercus rubra*, namely, *Xyleborus dispar* and *Trypodendron quercus* or *X. quercus*, are said to have made their appearance in the vicinity of Marche, Belgium.

Damage to Austrian pine in the Marne by Pityogenes bidentatus, A. VUILLET (*Rev. Phytopath. Appl., 1 (1913), No. 8, pp. 111, 112; abs. in Rev. Appl. Ent., 1 (1913), Ser. A, No. 11, p. 423*).—Plantations of *Pinus austriaca* in the Department of Marne are reported to have been seriously injured during the year through attacks of this beetle (*P. bidentatus*). The author states that it is also the most serious enemy of all other species of pine in France. It appears to confine its attack to trees of from 5 to 10 years old, boring galleries in the smaller branches immediately beneath the bark.

The pest is more or less successfully dealt with by leaving cut branches in the forest after the spring cutting, and, following the deposition of the eggs thereon by the beetles, collecting and burning the branches.

The yellow-headed coffee borer (Dirphya [Nitocris] princeps), C. C. GOWDEY (*Bul. Ent. Research, 4 (1914), No. 4, pp. 279–281, fig. 1*).—This beetle is a source of injury to coffee in the Chagwe District, Uganda, having first come to attention in 1910, when some of the estates, especially the older ones, suffered serious damage. The trees attacked by this pest, if allowed to remain untreated (by the injection of a few drops of carbon bisulphid or carbon tetrachlordid into the tunnels or the borer) are either killed outright or broken off by the wind.

Notes on the life history of Cyrtotrachelus longipes, D. O. WITT (*Indian Forester, 39 (1913), No. 6, pp. 265–272, pl. 1*).—This paper reports biological studies of *C. longipes*, based upon observations of its attack of bamboo (*Dendrocalamus strictus*). Life history studies based upon observations of its attack on *Melocanna bambusoides* have previously been reported by Stebbing.[a]

On the biology of Phytonomus murinus and its parasites, N. A. GROSSHEIM (*Reprint from Ent. Vêstnik [Kiev], 2 (1913), No. 1, pp. 21, figs. 15; abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 2, pp. 108–110*).—This is a report of investigations conducted in the government of Kuban in response to a request from this Department for information on the parasites of the alfalfa weevil.

Parasites of all stages of the weevil were discovered. The larva of an undetermined pteromalid feeds externally upon the eggs, the percentage of infestation being 13.33. *Canidiella curculionis*, an external parasite, attacks the larvæ of the host in the later stages, the parasitism reaching 3.16 per cent. The larvæ of *P. murinus* are also infested by two chalcidids, *Tetrastichus* sp., which is a primary internal parasite, and *Dibrachoides (Ptcromalus) dynaster*, an external parasite, the percentage of parasitism by these two species being low. The pupæ of *P. murinus* were parasitized externally by *Eulophus* sp., and internally by *Pimpla maculator*, the latter being the most important enemy and attacking 25 per cent of the pupæ.

During the year the natural enemies destroyed 71 per cent of the weevils.

Consumption of a hive of bees during the year, R. HOMMELL (*Vie Agr. et Rurale, 2 (1913), No. 22, pp. 653–655, figs. 2; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1913), No. 8, pp. 1266, 1267*).—It is stated that "the daily consumption of a bee varies from 0.003 to 0.12 gm. ac-

[a] Departmental Notes on Insects that Affect Forestry, II (Calcutta, 1903, pp. 193–197).

cording to the conditions of life, with a fairly general mean of 0.03 gm. The total food consumed by a worker larva in its feeding period is 0.4 gm.; the daily consumption of a drone is 0.04 to 0.05 gm."

It is estimated that the total annual consumption of a hive of bees is 480 lbs., of which maintenance of the bees requires 400 lbs., feeding of brood 70 lbs., and wax production 10 lbs.

Report on a collection of Hymenoptera made in Guam, Marianne Islands, D. T. FULLAWAY (*Proc. Hawaii. Ent. Soc., 2 (1913), No. 5, pp. 282–290*).—In this paper, which is based upon a collection of insects made by the author during the course of an official trip to the island of Guam in 1911, 53 species are listed and 11 are described as new to science. These include several species of some economic importance, namely, *Sclerodcrma duartcanum*, reared from a colopterous larva in cacao; *Allotropa thompsoni*, reared from a mealy bug (*Pseudococcus* sp.) on *Abrus abrus*; and *Cirrospiloideus guamensis*, reared from lepidoterous miners in *Terminalia catappa* and *Heriticria littoralis*.

A list by W. M. Wheeler of the Formicidæ collected has previously been noted (E. S. R., 27, p. 264).

A note on two species of bassid Ichneumonidæ parasitic on a species of syrphid larva, A. E. CAMERON (*Entomologist, 46 (1913), No. 599, pp. 130, 131*).—During the course of investigations at the University of Manchester the author found that pupæ of *Platycheirus albimanus* were parasitized by the two ichneumonids *Homocidus dimidiatus* and *H. tarsatorius*. This syrphid is said to prey upon *Pterocallis tiliæ*, an aphid infesting lime trees (*Tilia grandiflora*).

On some new and other species of Hymenoptera in the collections of the zoological branch of the Forest Research Institute, Dehra Dun, P. CAMERON (*Indian Forest Rec., 4 (1913), No. 2, pp. III+53*).—The first part of this paper (pp. 1–20) deals with the parasitic Hymenoptera reared at Dehra Dun from the lac (Tachardia) and sal insects. Several of the genera and species which are here described and enumerated appear to be of economic importance.

The second part (pp. 21–33) on some new and other species of nonparasitic Hymenoptera includes a description of a new species of sawfly (*Lophyrus indicus*).

Oophthora semblidis (Pentarthron carpocapsæ), description, biology, and utilization of it in the struggle with Carpocapsa pomonella, A. F. RADETZKY (*Turkest. Ent. Stansiia, 1913, pp. 28, pl. 1; abs. in Rev. Appl. Ent., 1 (1913), Ser. A, No. 11, pp. 431, 432*).—This chalcidid egg parasite is said to be the most important enemy of the codling moth in many districts of Russia.

The eradication of mosquitoes by the cultivation of bats, C. A. R. CAMPBELL (*Abs. in Internat. Inst. Agr. [Rome] Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1913), No. 8, pp. 1175–1181, pls. 2*).—The author points out that mosquitoes may form as high as 90 per cent of the food of bats. A wooden tower or "hygiostatic guano-producing bat roost," which he has devised for the colonization and protection of bats and erected near a large body of standing water located 10 miles south of the city of San Antonio, Tex., is described and illustrated, and the results obtained with it during the years 1911 and 1912 are reported.

"The commercial feature in the propagation of bats will insure its adoption, the hygienic benefits that follow will protect the community in which they are erected, especially the poorer classes who know nothing of the dangers of the mosquitoes or the use of screens, and amongst whom we find the most sickness. When we propagate this most useful creature, he not only destroys the disease-producing mosquito that serves it as food, but it actually converts that most malevolent of insects into a high grade fertilizer."

House flies and disease, E. H. Ross (*Jour. Roy. Soc. Arts, 62 (1914), No. 3200, pp. 388–397*).—A popular discussion.

Fruit flies and other insects attacking cultivated and wild fruits in New South Wales, W. B. Gurney (*Dept. Agr. N. S. Wales Farmers' Bul. 55 (1912), pp. 31, figs. 41*).—Most of the data here presented have been previously noted from another source (E. S. R., 27, p. 54).

A dipterous parasite of Glossina morsitans, E. E. Austen (*Bul. Ent. Research, 5 (1914), No. 1, pp. 91–93, fig. 1*).—A bombyliid of the subfamily Exoprosopinæ, reared from a pupa of *G. morsitans* collected in northern Rhodesia and here described as *Villa lloydi* n. sp., is said to be the first dipteran to be recorded as parasitic on any tsetse fly.

[The rearing of pomace flies on sterile media], A. Delcourt and E. Guyénot (*IV. Conf. Internat. Génétique Paris, Compt. Rend. et Raps., 1911, pp. 478–487*).—The authors have succeeded in rearing five generations of *Drosophila ampelophila* and one of *D. confusa* in absolutely sterile conditions and here describe the means by which this was successfully accomplished.

Oil sprays.—Five years' successful use, P. R. Jones (*Better Fruit, 8 (1914), No. 7, pp. 33–38*).—The author gives a general résumé of the different types of oil and oil preparations that have been used in the past throughout the United States, with special reference to the Pacific coast, with data on the types of oil used and the ones that should be used, manner of making emulsions and miscible oils, the insects against which they should be used, safety to the tree from these preparations, and the cost of the treatment.

FOODS—HUMAN NUTRITION.

Clams, oysters, scallops (*Maine Sta. Off. Insp. 55 (1913), pp. 149–156*).—The handling and marketing of shellfish are discussed on the basis of experimental studies, with special reference to the state pure food law.

Fresh clams opened in the laboratory "gave in dry matter from the drained meat 24.9 per cent of total dry solids." The sample analyzed from a lot of clams which had been soaked gave 15.9 per cent total dry matter, a difference of 9 per cent.

"Dealers and shippers of clams in this State are practically unanimous in the thought that opened clams will not keep longer than 24 hours in their own liquor." The almost universal practice to open the clams as promptly as possible after digging and throw the clam liquids away and then wash the clams in fresh water renders dealers liable to prosecution, provided there is evidence that the clams have been soaked or adulterated in any way.

With a view to testing the effects of different methods of handling, clams were examined which were opened raw and which were opened after dipping in hot sea water and after dipping in hot fresh water. "The highest percentages of dry solids in the clams were obtained from those that were opened raw. In general the dry solids of clams were slightly lower in hot salt water than when opened raw, and considerably lower when dipped in hot fresh water than in the case of either of the others. The Keag River clams which were opened in hot salt water carried 20.7 per cent of dry solids of clams. When allowed to soak overnight in salt water the solids fell in the clams to 15.3 per cent."

To comply with the Maine food standards, "opened clams must be sold drained and without any surplus liquid. . . . They may be rinsed in water but must not remain in water more than 1 minute. When it is desired to heat clams before they are opened they may be immersed in hot water not more than 2 minutes. They may then be immediately put into cold water for not more than 2

minutes. The clams then should be opened, drained and handled exactly the same as raw opened clams. Natural clam liquid or juice may be sold as such but can not be mixed with opened clams and the mixture sold as clams. The solids and liquids of clams are quite constant. By laboratory methods it is readily ascertained whether the above conditions have been complied with."

The results of the examination of a number of samples of clams are reported.

Data are also given regarding the examination of a number of samples of oysters and of scallops. It is pointed out that the situation as regards oysters "has steadily and markedly improved during the past five years," with reference to the proportion of total solids and total dry matter present.

"Scallops as sold in the market consist of the large muscle that holds the two shells together. The remainder of the scallop is thrown away as unfit for food. There are two species of scallop, the giant scallop which is the one that is fished in Maine waters, and the ordinary scallop of more southern waters. . . .

"The scallops grow in deep water and are obtained by dredging. The Maine fishing grounds extend from Penobscot Bay east. As a rule the fishermen open and 'cut' their scallops the night of the day of fishing. As soon as the scallops are 'cut' the edible portion or muscle is put in a tub with salt water. They are usually delivered to the shippers in this condition."

The method of handling and marketing scallops is described. After weighing, dealers usually wash them with fresh water, drain them, keep them in sea water overnight (1 gal. to a 10-gal. bucket of scallops), then wash them again in fresh water, drain them, and after draining ship them in bags placed in tubs containing chopped ice. The shippers claim that the scallops are covered with a slime and that it is necessary to wash them thoroughly in fresh water or else the scallops will not keep. They also claim that this method of shipping is better than shipping in vessels surrounded by ice. The results obtained in the examination of scallops make it probable that "Maine scallops treated as outlined above would carry not less than 20 per cent dry matter in the scallops, with an average higher than that figure."

The food value of fish after cold storage (*Jour. Amer. Med. Assoc., 62 (1914), No. 3, pp. 208, 209*).—A digest of data in which it is pointed out that although the possibilities of preserving fresh fish by the freezing process are excellent, such processes "do not give a clean bill of health to animal tissues removed from cold storage and exposed until sold or even kept iced in a common refrigerator. Neither can spoiled food be adequately preserved by any method. It is unfortunate that the efficiency of useful processes is sometimes impugned by unjustifiable applications of it. This has been true of cold storage."

Studies on the ripening and decomposition of meat. D. OTTOLENGHI (*Ztschr. Untersuch. Nahr. u. Genussmtl., 26 (1913), No. 12, pp. 728–758, figs. 8*).—On the basis of physico-chemical and bacteriological studies of the changes which take place in meat during ripening and the early stages of decomposition, the author proposes a method for judging the relative freshness of meat. He regards the method as simple, rapid, and adequate for the purpose, providing the results of bacteriological studies are also taken into account.

The slaughtering and meat packing industry (*Thirteenth Census U. S., 10 (1913), pp. 331–353, figs. 2*).—According to the classification adopted for presenting the statistics of the Census for 1909, the slaughtering and meat packing industry includes wholesale slaughtering and meat packing establishments, public abattoirs, and establishments making a specialty of manufacturing sausage, but does not include the retail butcher business. The report distinguishes three classes of establishments: (1) Those whose chief products are cured and

packed meats; (2) those whose chief products are fresh meats; and (3) those whose chief product is sausage.

Of the 1,641 establishments canvassed, 40 per cent were engaged primarily in slaughtering and meat packing; "these establishments employed 90.7 per cent of the total number of wage-earners and contributed products to the value of $1,204,248,578, or 87.9 per cent of the total for the industry as a whole. Although establishments engaged chiefly in slaughtering formed approximately 1/3 (34.4 per cent) of the total number, they employed only 7.2 per cent of the total number of wage-earners, and the value of their products represented but 11 per cent of the total for the entire industry. The 420 establishments engaged chiefly in the manufacture of sausage reported 2.1 per cent of the wage-earners and contributed 1.1 per cent of the total value of products. In the case of establishments engaged primarily in meat packing, the cost of materials equaled 88 per cent of the value of products; in the case of those engaged primarily in slaughtering, 87.4 per cent; and of those making sausage, 75.8 per cent."

Eggs from the standpoint of nutrition, DELAYE (*Bul. Soc. Chim. Belg., 27 (1913), No. 12, pp. 310, 311*).—In connection with this discussion of the nutritive value of eggs, statistics regarding egg production, particularly in Belgium, are given.

A study of flours and meals of different sorts, E. GURY (*Mitt. Lebensm. Untersuch. u. Hyg., Schweiz. Gesundhsamt., 4 (1913), No. 3, pp. 112–121, fig. 1*).—Determinations of water, water absorbing power, protein, gluten, cellulose, and gliadin were made with ground wheat, rice, beans, potatoes, and other materials. The results obtained are reported, but the article as a whole is chiefly concerned with a comparison of methods.

Flour-mill and gristmill industry (*Thirteenth Census U. S., 10 (1913), pp. 403–426, figs. 2*).—Of the 23,652 mills canvassed for this report, which covers the year 1909, more than half were custom mills, but of the total value of the products ($938,699,958), only $55,115,553, or 5.9 per cent, was contributed by this class. "More than three-fourths of the merchant mills were engaged chiefly in the manufacture of wheat flour and other products intended for human consumption, and the value of the products of these mills was $832,790,364, or 88.7 per cent of the total for all mills combined.

"For both custom and merchant mills the value of products includes the estimated value of the flour and other products obtained from grain ground on a custom basis, and, similarly, the figures for cost of materials include the estimated cost of such grain. . . . "The flour-mill and gristmill industry is one in which the cost of materials constitutes a very large proportion of the total value of products, the process of manufacture itself being relatively simple and inexpensive. The total cost of the materials used by all mills in 1909 was $813,891,347, which was equal to about seven-eighth (86.7 per cent) of the total value of products, while the value added by manufacture (that is, the value of products less the cost of materials) was only $124,808,611."

Digestion experiments on men with cotton-seed meal, J. B. RATHER (*Texas Sta. Bul. 163 (1913), pp. 26*).—In continuation of earlier work (E. S. R., 23, p. 566), using men as subjects, the author studied the digestibility of cotton-seed meal in comparison with meat and canned chicken loaf, these foods being used as a part of a simple mixed diet. The cotton-seed meal (or flour) was made into bread with corn meal, in the proportion of 1:2 in the first case and of about 1:4 in the second case. The urine was analyzed as well as the food and feces.

According to the author's summary, "7 digestion experiments were made with men; 3 being with cotton-seed meal, 2 with cotton-seed flour, and 2 with meat.

"The digestibility of the protein of cotton-seed meal averaged 77.6 per cent and that of cotton-seed meal-flour 78.4 per cent. . . . It is eight-tenths as digestible as that of meat and nine-tenths as digestible as that of cereals, and equally as digestible as that of peas and beans.

"The digestibility of the fat of cotton-seed meal and flour appears to be very high. The fats are probably digested about 95 per cent and the carbohydrates about 68 per cent. The fat of meat was digested 99 per cent. . . .

"Cotton-seed food products made from 1 part cotton-seed meal and 4 parts wheat flour contain from one-third to less than one-half more digestible protein than eggs. The digestible fat and carbohydrates of cotton-seed meal, calculated as fat, are nearly equal in amount to that of beef flank, and more than equal to that of beef loin and mutton leg."

A number of recipes are given for making cotton-seed meal food products. In the author's opinion, these foods are as palatable as similar ones made from corn meal or wheat flour.

"In preparing cotton-seed cakes or bread, use 1 part cotton-seed meal or flour to 4 parts corn meal or wheat flour, and use the same recipes commonly used for wheat and corn bread and cakes. . . .

"One part of fresh, sweet meal, sifted free from hulls and lint should be used mixed with at least 4 parts of corn meal or wheat flour. Diluted in this way, few people will be able to eat more than 2 oz. of cotton-seed meal daily. Cotton-seed meal should not be eaten in addition to meat, unless it is known that too little meat is being eaten."

In a preface to the bulletin, G. S. Fraps summarizes similar data regarding the general question of the use of cotton-seed meal as food for man.

Rice cleaning and polishing (*Thirteenth Census U. S., 10 (1913), pp. 451–459*).—Of the 71 establishments included in making the report for 1909, 41 were engaged exclusively in merchant milling, 8 exclusively in custom milling, and 22 in both merchant and custom milling, but largely merchant milling. In 1904 there were 12 mills engaged exclusively in merchant milling, 31 exclusively in custom milling, and 31 in both merchant and custom milling, the larger part of the operations of mills of the last class being custom milling.

A total of 1,777 persons were engaged in the 71 establishments included. Of these, 1,239 were wage-earners. "The value of products was $22,371,457, but the value added by manufacture was only $2,870,377."

In a comparison of the present with earlier statistics, it is pointed out that "rice has been cultivated in the United States for more than 200 years, and prior to the Civil War had reached considerable proportions. The largest gain, however, has occurred during the last decade, during which period the production quadrupled."

With the exception of Oregon and Washington, where only foreign-grown rice was treated, the rice cleaning and polishing industry in the United States was confined in 1909 to six Southern States (Arkansas, Louisiana, South Carolina, Texas, Georgia, and North Carolina). The establishments there treated domestic rice exclusively. Louisiana reported 56 per cent of the total value of products, and Texas 36.4 per cent.

The soy bean and its use for food and condimental purposes, C. GRIMME (*Konserv. Ztg., 15 (1914), Nos. 1, pp. 1–3; 2, pp. 10, 11*).—Data are presented regarding the manufacture, characteristics, composition, and uses of soy bean milk, soy bean cheese (curd), soy bean bread, soy sauce, and other products.

Servian plum butter (*Konserv. Ztg., 15 (1914), No. 2, pp. 11, 12*).—A summary of studies by W. Brunetti on the composition and characteristics of a large number of samples.

Canning and preserving (*Thirteenth Census U. S., 10 (1913), pp. 379–401, fig. 1*).—Statistics are presented for the year 1909 in comparison with other years for the canning and preserving industry as a whole. Four classes of establishments are taken into account, namely: (1) Those whose chief products are canned and preserved fruits and vegetables, including dried and packed fruits put up by the packing house; (2) those whose chief products are canned and cured fish, including pickled, smoked, and dried fish; (3) those whose chief products are canned oysters and clams; and (4) those whose chief products are pickles, preserves, jellies, sauces, etc.

In 1909 the industry as a whole gave employment on the average to 71,972 persons, of whom 59,968 were wage-earners, and paid out $26,945,466 in salaries and wages.

"In the canning and preserving industry the cost of materials constitutes a large proportion of the total value of products, the processes of manufacture being relatively simple and inexpensive. The combined cost of the materials used by all four branches of the industry in 1909 was $101,823,059, which is equal to 64.8 per cent of the total value of products ($157,101,201). . . .

"In the case of establishments engaged primarily in canning fruits and vegetables the cost of materials represented 68.4 per cent of the value of products; in the case of those handling fish principally, 62.4 per cent; of those chiefly canning oysters and clams, 55.8 per cent; and of those making chiefly pickles, preserves, and sauces, 58.4 per cent. It should be noted that the cost of cans and other containers is an important factor in the cost of materials."

Tin poisoning from canned asparagus, A. Friedmann (*Ztschr. Hyg. u. Infektionskrank., 75 (1913), No. 1, pp. 55–61*).—Experimental data led the author to conclude that canned asparagus may be the cause of tin poisoning.

Carbonated and other beverages (*Maine Sta. Off. Insp. 56 (1914), pp. 12*).—Data are given regarding the character of malt extract and beerlike beverages containing a low percentage of alcohol and also regarding the examination of a number of bottling establishments.

Laws, rules, and regulations pertaining to [foods, drugs, etc.] (In *Nebr. Food, Drug, Dairy and Oil Com. Laws, Lincoln, 1913, pp. 77*).—The text of the laws pertaining to foods, drugs, paints and oils, cold storage, petroleum products, weights and measures, commission merchants, and other related subjects is included.

Report upon an act relative to the cold storage of certain food products (*Ann. Rpt. Bd. Health Mass., 44 (1912), pp. 453–462*).—Data are given regarding the licensed cold-storage or refrigerating warehouses and cold-storage rooms in the State. Rules and regulations governing the business of cold storage, made under the provisions of the state law, are given in full.

Results of analyses of food samples (*Mo. Bul. Ind. Bd. Health, 16 (1913), No. 11, p. 277*).—According to the data summarized, out of a total of 1,257 samples of miscellaneous foodstuffs examined during the year ended September 30, 1913, 31.9 per cent were adulterated.

Food and drug inspection (*Ann. Rpt. Bd. Health Mass., 44 (1912), pp. 381–391*).—Out of a total of 7,617 samples examined, 1,780 did not conform to the provisions of the state law.

Report of the analyst, H. C. Lythgoe (*Ann. Rpt. Bd. Health Mass., 44 (1912), pp. 393–452, figs. 3*).—Details are given of the year's work in the examination of foods and drugs. See above.

[Examination of food materials], H. E. Wiedemann et al. (*Bul. Food and Drug Dept. Missouri [1913], pp. 46*).—Data are given regarding a large number of samples.

Of 370 samples of food materials, soft drinks, and miscellaneous materials examined, 147 were not passed. Reports of inspection work and of the legal department of the pure food and drug work are included.

Drugs (*Maine Sta. Off. Insp. 48 (1913), pp. 21–28*).—Data are given regarding the inspection of drug stores and the examination of a number of drugs.

Protection of food offered for sale (*Maine Sta. Off. Insp. 49 (1913), pp. 29–36*).—Questions which have to do with the contamination and protection of food are discussed, with special reference to the provisions of the Maine state law.

[The possibility of conveying typhoid fever by clothing, contaminated food, and soiled fingers], S. L. Cummins (*Jour. Roy. Army Med. Corps, 20 (1913), No. 6, pp. 635–665, fig. 1*).—In an article on the causation and prevention of enteric fever in military service, with special reference to the importance of typhoid carriers, experimental data are reported which demonstrate the possibility of conveying this disease by means of the clothing and the soiled fingers of typhoid carriers, as well as the results of experiments which have to do with the possibility of the survival of the living *Bacillus typhosus* in foods and of the infection of foods by typhoid carriers.

"It is obvious that the contamination of food before cooking will usually be rendered harmless when the temperature of the food is raised. Contamination after cooking will be very dangerous even if the food is consumed immediately after the contamination takes place. The fingers of a typhoid carrier may be the vehicles of millions of germs. A single drop of urine . . . may contain anything from 1,000,000 to 300,000,000 typhoid bacilli, and these will multiply in soup at the temperature of serving. Again, soup contaminated, allowed to cool, and 'warmed up' again to a temperature just pleasant for drinking, may be very dangerous, especially if the soup has been covered to keep out dust in the interim."

Fecal contamination of roller towels (*Ann. Rpt. Bd. Health Mass., 44 (1912), pp. 549–552*).—The experimental data reported showed that a considerable portion of public roller towels became thus contaminated. The possibility of spreading typhoid infection by such means is pointed out. Such work has a direct bearing on the possibility of conveying disease by means of contaminated food.

The grocer's encyclopedia, compiled by A. Ward (*New York, 1911, pp. 748, pls. 80, figs. 373*).—This volume, designed especially for grocers and general storekeepers, gives data regarding foods and their origin and care in the home and market, and other general information. The material is arranged alphabetically and the text is supplemented by numerous illustrations.

Yearly and monthly prices of the most important foodstuffs and other household materials in 155 districts in Prussia in the year 1911 (*Preuss. Statis., No. 232 (1911), pp. XIII+196*).—A large amount of statistical data is presented. The introduction is contributed by F. Kühnert.

Dining at the Alexandra Trust (*Epicure, 21 (1914), No. 242, p. 28*).—In an article by P. Gibbs from the *Daily Chronicle*, London, some information is given regarding the sale of wholesome and nutritious, yet inexpensive, meals at this hotel designed for working people.

Portable rations, G. Fahey (*Jour. Roy. Army Med. Corps, 21 (1913), No. 1, pp. 87–89*).—Suggestions are made regarding the make-up of a portable ration for army use which would supply the food necessary for a number of days.

[Menu making and the nutritive value of meals], Emma S. Jacobs (*Jour. Home Econ., 6 (1914), No. 1, pp. 15–20, 57–62*).—The author discusses ways in which the results of studies of housekeeping problems may be made of practi-

cal use to the housekeeper in arranging a diet which is in reasonable accord with dietary standards, due regard being paid to cost and to character of materials.

Feeding experiments with isolated food substances, T. B. OSBORNE, L. B. MENDEL, and EDNA L. FERRY (*Carnegie Inst. Washington Pub. 156, pt. 2 (1911), pp. III+55–138, pls. 2, figs. 108*).—Continuing work previously noted (E. S. R., 25, p. 864), the authors report investigations of the nutrition factors which influence growth. In the experimental data cited laboratory animals (rats) were used.

Especial attention is paid to such problems as the suspension of growth on a maintenance diet, the effect of stunting on the growth impulse, the effect of partial starvation on body weight and on the nervous system, a comparison of milk and mixed diet, and a study of isolated proteins and "protein-free" milk. Conclusions from the authors' discussion of the results presented and their bearings follow:

"A comparison of the two groups of proteins—those adequate and those inadequate for growth purposes—at once reveals the fact that the latter category comprises proteins (gliadin, hordein, zein) commonly spoken of as chemically 'incomplete.' They lack one or more of the amino acid complexes which are obtainable from the so-called 'complete' proteins. None of them furnish glycocoll or lysin, and zein in addition is devoid of tryptophane. By feeding relatively small quantities of proteins like casein with gliadin growth begins at once. Here we can determine the minimum of suitable protein to satisfy this growth requirement. . . . The addition of amino acids to 'complete,' as it were, the inadequate proteins can now be studied amid controllable factors; the biological rôle of hydrolyzed proteins and the significance of complete hydrolysis or digestion in nutrition can be examined anew.

"The experiences which have demonstrated the striking differences in value of the individual proteins and the small proportion of casein which suffices to induce growth instead of standstill . . . emphasize the importance of the purity of the protein fed. . . .

"The animals must here have synthesized their phosphorous compounds from inorganic phosphorus. Whether milk production and other functions calling for such synthetic reactions will continue adequately is open to investigation. It is also noteworthy that all of our animals grow on a dietary that is purin-free, or essentially so. Here the question of purin sybthesis suggests itself. It is apparent, e. g., in the case of gliadin, that the grown as well as ungrown rats may be maintained for long periods on single proteins.

"With such an ideal nonprotein dietary component at hand amino acid substitutions can be attempted in the adult as well as in the growing animal. The protein minimum (or minima) is also open to accurate investigation. With a method of feeding devised which will permit a differentiation between growth and maintenance, which furnishes an energy-yielding protein-free component that is appropriate, and leaves the protein as the sole variable in the dietary, we believe that further contributions can be made to the problems of nutrition."

Influencing the bone growth by food poor in phosphorus, G. SCHMORL (*Arch. Expt. Path. u. Pharmakol., 73 (1913), No. 4, pp. 313–346, fig. 1; abs. in Chem. Zentbl., 1913, II, No. 21, pp. 1813, 1814*).—In experiments with laboratory animals (dogs) it was found that food poor in phosphorus resulted in a diminished production of bone substance.

Experiments bearing on the functions of the liver in the metabolism of fats, I, H. S. RAPER (*Jour. Biol. Chem., 14 (1913), No. 2, pp. 117–134*).—In this, the first of his studies of the digestion and absorption of fat, the author reports

experiments on the hepatic functions in fat metabolism, using laboratory animals as subjects.

According to the author's summary, "coconut oil administered to cats or dogs by the mouth can be detected in the liver in 5 or 6 hours. The amount present after times varying from 5 to 12 hours does not exceed 6 per cent of that absorbed."

When a solution of coconut oil soaps containing glycerin and bile salts was run into the small intestine, and when a very fine emulsion of coconut oil was given intravenously, much larger percentages, respectively, of the absorbed fatty acid and of the oil were found in the liver.

"It is probable that the greater retention of the oil by the liver when it is administered in the form of soap or a fine emulsion is partly due to the anesthetic and partly to the rapidity of administration.

"When coconut oil is being absorbed, the fat in the chyle contains fatty acids with an average higher molecular weight than those in the oil administered. It is probable, therefore, that the lower fatty acids in the oil are partly absorbed as sodium salts.

"The volatile acids obtained from the liver in the above sets of experiments absorbed more iodin than the volatile acids from normal livers. The increase was not great but it probably indicates that saturated fatty acids containing 10, 12, or 14 carbon atoms may become unsaturated in the liver."

On the reinspiration of expired air, T. R. CROWDER (*Arch. Int. Med., 12 (1913), No. 4, pp. 420–450; abs. in Zentbl. Biochem. u. Biophys., 16 (1913), No. 1–2, p. 48*).—According to the author's conclusion, with complete body rest, from 1 to 2 per cent of the expired air is again inspired.

A study of the hygienic condition of the air in textile mills with reference to the influence of artificial humidification, H. W. CLARK and S. DEM. GAGE (*Ann. Rpt. Bd. Health Mass., 44 (1912), pp. 659–692*).—Methods for examining air are described and the effect of humidifying air discussed on the basis of the experimental data recorded.

ANIMAL PRODUCTION.

Genetics, H. E. WALTER (*New York, 1913, pp. XIV+272, pl. 1, figs. 71*).—Chapters are included in this book on the carriers of the heritage, variation, mutation, the inheritance of acquired characters, the pure line, segregation and dominance, reversion to old types and the making of new ones, blending inheritance, the determination of sex, the application to man, and human conservation. A bibliography of 26 references is appended.

The present state of the question of inbreeding in Germany, H. KRAEMER (*Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1913), No. 8, pp. 1150–1157*).—It is stated that "in Germany in all the important branches of stock breeding the question of inbreeding is being most actively studied. Instead of entertaining opinions, views, and prejudices, the tendency is to form a solid foundation of facts. These efforts have a far-reaching importance and in all cases when the herd books have allowed it they have obtained valuable results. It has been found everywhere that really important breeding animals always belong to families in which the excellence of their blood is especially due to a few preeminent ancestors, and when this is recognized the real value of inbreeding and of lines of blood is put in its true light. . . . On the whole the present tendency is toward emphasizing selection, a more rigorous picking out of favorable hereditary variations."

Respiration and assimilation in ruminants, N. ZUNTZ, R. VON DER HEIDE, KLEIN, ET AL. (*Landw. Vers. Stat., 79–80 (1913), pp. 781–814, fig. 1*).—This outlines methods for the study of the respiration and assimilation processes in the ruminant, giving a description of the respiration apparatus used.

Importance of calcium and phosphoric acid in the animal organism.—II, Value of the principal phosphorus compounds to the ruminant, G. FINGERLING (*Landw. Vers. Stat., 79–80 (1913), pp. 847–870*).—Results of experiments in the feeding of casein, phytin, lecithin, nuclein, sodium nucleinate, and disodium phosphate in rations to goats indicated that a comparatively large percentage of the P_2O_5 in these phosphorus-containing materials was retained by the animal body.

Calculation of market value of feeding stuffs, T. PFEIFFER (*Landw. Vers. Stat., 79–80 (1913), pp. 279–321*).—Basing his calculations on the manurial value of the nitrogen, potash, and phosphoric acid contained in feeding stuffs, the digestible protein, and Kellner's starch values, the author estimates the actual value of various feeding stuffs as determined by local prices.

Method of estimating the market value of feeding stuffs on the Kellner basis, H. NEUBAUER (*Landw. Vers. Stat., 79–80 (1913), pp. 465–490, fig. 1*).—Taking the local prices for a number of feeding stuffs, the author calculates the actual market value per kilogram of starch and of digestible protein. A graduated scale is then proposed for estimating the value of feeds, based on fluctuating market prices.

Composition and digestibility of the chloroform extract of hays and fodders, G. S. FRAPS and J. B. RATHER (*Texas Sta. Bul. 162 (1913), pp. 5–20*).—These studies have been previously reported from another source (E. S. R., 28, p. 69), and continue earlier work (E. S. R., 28, p. 108). The composition and average digestibility of the constituents of chloroform extract of the following hays and fodders are given: Alfalfa hay, Bermuda hay, buffalo grass hay, bur clover, corn shucks, Guam grass, Johnson grass, Johnson grass hay, Kafir corn fodder, millet, oat hay, Para grass hay, peanut hay, rice straw (Japan), rice straw (Honduras), sorghum hay, and vetch hay.

Preliminary investigation into the variation in the physical composition of wheat milling offals, H. T. CRANFIELD (*Jour. Agr. Sci. [England], 6 (1914), No. 1, pp. 102–110*).—With a view to obtaining a definite classification of wheat milling offals, a study was made of the appearance, physical composition, sieving, apparent density, proportion of flour, and purity of a large number of samples ranging in grade from fine middlings to coarse bran.

The samples were graded into 10 classes by their appearance. The percentage of moisture varied in different samples, ranging from 10.21 to 11.37, but is not regarded as a factor to be considered in this classification. The germ content of the offals was small and was also of little importance. The husk and flour constituents were found to be the most important items in solving the problems of grading. The separation of the flour from the husk by sieving was found to be impracticable.

The following method was evolved for determining the densities of husk and flour, and gave figures showing quite a large variation between the finest and coarsest offals: "About 20 gm. of the offal was dried in a steam oven at 100° C. for 5 hours (this was found to be ample time for completely drying the substance). After cooling in a desiccator 15 gm. was quickly weighed out and transferred to a 100 cc. graduated cylinder, the cylinder being gently tapped while the offal was sifted in. The cylinder was then jolted on a wooden slab until the contents had reached approximately a constant volume. Finally a 100-gm. lead weight (made to fit the cylinder exactly, and having a stout rubber

washer glued to the bottom) was gently lowered on to the surface of the offal in the cylinder, and the tapping continued until the volume was constant. The whole test occupied not more than 4 minutes."

With normal samples the method gave results agreeing fairly well with the classification according to appearance. It is assumed that the apparent density figure varies directly as the percentages of flour and husk and the fineness of these two fractions. The proportion of flour in the sample was determined by estimating the percentage of starch in the substance and multiplying this by a factor. The washings from a sample of the offal were centrifuged, the deposit of starch washed with alcohol, dried, and weighed, and the percentage of crude starch calculated. Fine offals contained protein matter ranging from 2.3 to 3.8 per cent, and coarse offals approximately 13.5 per cent. The crude starch percentage ranged from approximately 45 in the first group to 15 per cent in the tenth group.

A purity test showed the principal impurities to be weed seeds and oat husk. It is believed that these and other impurities should be excluded from commercial products so far as possible. It is recommended that a series of determinations, consisting of percentage of moisture, apparent density, percentage of starch, and purity be agreed upon; that a series of grades of offals be arranged with stated limits for percentage of starch and apparent density; that limits be set for all offals as regards percentage of moisture and purity; that local names be dropped as far as possible and such names as "fourths," "thirds," "seconds," "bran," and "broad bran" be utilized for the standard grades; and that millers be asked to cooperate in some definite scheme for bringing all wheat offals within the range of a system of standardization such as suggested here.

The making and feeding of silage, T. E. WOODWARD ET AL. (*U. S. Dept. Agr., Farmers' Bul. 578 (1914), pp. 24, figs. 6*).—This is a revision of and supersedes Farmers' Bulletin 556 (E. S. R., 29, p. 869).

Silos and ensilage, W. R. DODSON and C. H. STAPLES (*Louisiana Stas. Bul. 143 (1914), pp. 20, figs. 15*).—This bulletin contains general information on silo construction, silage crops, and rations containing silage.

Composition and value of grapevines as feed material, M. KLING (*Landw. Vers. Stat., 79–80 (1913), pp. 737–771*).—In this article numerous experiments are cited showing the value of grapevines as feed material for milch cattle and sheep.

The average composition of various portions of the vine is reported as follows:

Composition of grapevines.

Portion of vine.	Water.	Protein.	Fat.	Nitrogen-free extract.	Fiber.	Ash.
	Per cent	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Entire vine	72.59	3.85	0.90	15.06	5.52	2.08
Wood, material	71.43	1.33	.25	16.60	9.04	1.35
Foliage	73.06	4.86	1.16	14.47	4.08	2.37

The digestibility of the foliage was found to be protein 59 per cent, fat 79, nitrogen-free extract 65, fiber 38; and for the woody material, 15, 88, 42, and 19 per cent, respectively. The ash of the foliage was found to contain phosphoric acid 11.66 per cent, calcium 32.04, and potassium 18.61; the woody material, 11.99, 19.77, and 34.04 per cent, respectively; and the entire vine, 11.56, 29.91 and 21.45 per cent, respectively.

A bibliography of 27 references is appended.

Commercial feeding stuffs. R. E. STALLINGS (*Bul. Ga. Dept. Agr., No. 60 (1913), pp. 119, fig. 1*).—This reports analyses of the following feeding stuffs: Molasses feed, meat scrap, alfalfa meal, dried-beet pulp, rice bran, rice polish, tankage, crushed oats, proprietary mixed feeds, poultry and stock feeds, cotton-seed meal, wheat shorts, wheat bran, wheat middlings, ship stuff, white shorts, corn meal, corn bran, hominy meal, and cracked corn.

The text of the law regulating the sale of feeding stuffs is included, together with rules and regulations relating to the law, standards of purity of grain as adopted by the commissioner of agriculture and state chemist, grades for commercial corn, definitions of feeds, etc.

Feeding stuff inspection (*Maine Sta. Off. Insp. 50 (1913), pp. 37–76*).—Analyses are reported of the following feeding stuffs: Cotton-seed meal, gluten meal, linseed meal, distillers' grains, red dog flour, wheat middlings, bran, hominy feed, and various mixed and proprietary feeds.

The chief requirements of the Maine feeding stuffs law are enumerated.

The analysis and registration of commercial feedstuffs, L. A. FITZ (*Kansas Sta. Bul. 195 (1913), pp. 493–520*).—This bulletin gives a list of firms registering feeds for the fiscal year ended June 30, 1914, with guaranties, a table giving average analyses of mill products for the previous year, a discussion of the state feeding stuffs law, and other data.

Feeding stuffs, A. P. SANDLES (*Off. Rpt. Sec. Ohio Bd. Agr. on Feed Stuffs, 1912, pp. 128*).—This reports analyses of the following feeding stuffs: Germ oil meal, malt sprouts, cotton-seed meal, alfalfa meal, meat meal, hominy feed, dried distillers' grains, tankage, molasses feeds, gluten feed, gluten meal, rice meal, bran, chop, dried beet pulp, linseed meal, screenings, beef scrap, barley sprouts, proprietary mixed feeds, etc. There are included definitions of the various feeding stuffs, articles on screenings and their use, cotton-seed meal, cereal milling offals, tankage, and other subjects relating to the feeding of animals. There is also given an index to manufacturers and dealers in feeding stuffs, and the text of the Ohio feed stuffs law.

Live stock of the United States (*U. S. Dept. Agr., Farmers' Bul. 575 (1914), pp. 1–29, 34–39*).—"The estimates for January 1, 1914, indicate that there are 20,962,000 horses and 4,449,000 mules in the United States, an average annual increase of about 1.4 per cent over the number shown by the Census of 1910. It is estimated that the average farm price of horses has increased from $108.03 in the census year to $109.32 in January, 1914, and in the case of mules from $120.20 to $123.85 in the same period. On this basis the total farm value of horses is $2,291,638,000 and of mules $551,017,000, . . . an increase of $194,082,000 over the census year and represents an annual increase of wealth from these sources of $48,520,000.

"The estimates indicate a slight increase in the number of milch cows since the census year, equivalent to an increase of about 0.5 per cent, the estimated number now being 20,737,000. On the other hand, the average farm price of milch cows has increased from $35.29 in the census year to $53.94 in January, 1914, or an increase of 50.7 per cent. On this basis the farm value of milch cows now in the United States is estimated at $1,118,487,000 as compared with their estimated value in the census year of $727,802,000 . . .

"With regard to meat animals, that is, 'other cattle,' sheep, and swine, the estimates indicate a steady and fairly uniform decrease in the number of cattle and sheep, a slight increase in the number of swine, and a considerable increase in the average farm price of cattle and swine since the census year of 1910. In the case of cattle the number has decreased from 41,178,000 in the census year to 35,855,000 in January, 1914 . . . In the case of sheep the number is estimated to have decreased from 52,448,000 in the census year to 49,719,000

. . . In the case of swine, the Bureau of the Census reported 58,186,000 on April 15, 1910; on January 1, 1914, it is estimated that there were 58,933,000 in the United States . . .

"As compared with the census year 1910 it is estimated that the farm price of cattle other than milch cows has increased from $19.07 to $31.13, or 63.2 per cent . . . The price of sheep has decreased from an estimated average farm value of $4.12 in 1910 to $4.04 in 1914; swine increased from $9.17 to $10.40 per head in the same period, or 13.4 per cent.

"The estimated total number of these 3 classes of meat animals on January 1, 1914, is 144,507,000 as compared with 151,812,000 in the census year of 1910, or a decrease of 7,305,000 animals; but because of the higher prices the present farm value of these animals is estimated at $1,930,087,000 as compared with $1,534,600,000 in the census year, or an increase in valuation of $395,487,000."

Relatively to the population, which has increased from 91,972,000 to 98,646,000, there is an accumulated shortage in the past 4 years of 3.5 per cent in the number of horses and 9.8 per cent in number of mules, 4.4 in milch cows, 19.2 in other cattle, 11.6 in sheep, and 5.2 per cent in swine. The contributing causes to the shortage in number of animals and the geographic redistribution of all classes of farm animals are discussed.

The per capita consumption of meat was 213.4 lbs. in 1900, 198.4 lbs. in 1909, 160.3 lbs. for 1914; and the total consumption was 16,220,000,000 lbs. in 1900, 17,966,000,000 lbs. in 1909, and as roughly estimated 15,810,000,000 lbs. of meat in 1914. The total production of meat was 18,653,000,000 lbs. in 1900, 19,229,000,000 lbs. in 1909, and the estimate for 1914 is 16,675,000,000 lbs. Exports of meat decreased from 1900 to the fiscal year 1913 by 64.5 per cent. The total number of cattle, including a few introduced for breeding purposes, imported in 1912 was 318,372, in 1913, 421,649, and in the first 5 months of 1914, 404,313, almost entirely from Mexico and Canada. The imported sheep of 1912 number 23,588, for 1913, 15,428, and for the first 5 months of 1914, 75,620, mostly from Canada. During the first 6 months of the fiscal year 1914, the imports of beef and veal had a total of 33,645,364 lbs., of mutton and lamb 439,065 lbs., of pork 286,871 lbs., and of bacon and hams 116,130 lbs. Previous imports have been very small. The principal countries contributing to the total imported meat and meat products were in order of magnitude of contribution Argentina, Canada, and Australia.

A comparative table of old and new tariff rates on meat animals and the principal meat and meat animal products is given.

Live stock report, Chicago, 1913 (*Union Stock Yard and Transit Co. Chicago, Ann. Live Stock Rpt., 48 (1913), pp. 56*).—This report gives the receipts and shipments of live stock at the Union Stock Yards, Chicago, for 1913, together with a summary of receipts, shipments, and valuation of all live stock during the past 48 years, the range in prices during the year for cattle, horses, sheep, and hogs, and an account of the grand champion steers and carloads of fat cattle shown at the International Stock Show during the past 13 years.

Beef production in the South, W. F. Ward and D. T. Gray (*U. S. Dept. Agr., Farmers' Bul. 580 (1914), pp. 20, figs. 9*).—Popular instructions are given on handling and feeding beef cattle, the best breeds for the South, and the best pasture plants. Numerous cattle-feeding experiments, previously reported from other sources, are cited.

Experiments on the moorland pastures, B. Tacke (*Landw. Jahrb., 44 (1913), No. 1–2, pp. 193–267, figs. 4*).—This article reports results of extended experiments covering a period of 7 years with steers and oxen pastured on drained

and limed moorland meadows. The average daily gains ranged between 1.93 and 2.47 kg. per hectare (1.7 to 2.2 lbs. per acre).

Utilization of skim milk as feed for calves.—Summary of experiments carried out on 60 calves, A. PIROCCHI (*Ann. Ist. Agr. [Milan], 11 (1912–13), pp. 9–19, figs. 3; Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1913), No. 8, pp. 1157–1164, pl. 1, fig. 1*).—As the result of feeding trials with 60 calves it is concluded that skim milk mixed with oleomargarine and starch treated with diastasolin (a saccharifying substance extracted from malt) or with levulin (a distillery product having the power of transforming starch into dextrin) may be advantageously employed as feed for calves destined for the butcher.

The jerked beef industry in Argentina, J. E. RICHELET (*Bol. Min. Agr. [Buenos Aires], 14 (1912), No. 9, pp. 986–1029; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1913), No. 4, pp. 643–645*).—It is stated that in 1911 12,975 tons of jerked or salted meat were exported from Argentina. While the industry has been injured by the rise of the cold stored meat trade it is thought that there is yet a considerable field for it, especially in Brazil, where a large portion of the beef consumed consists of the jerked product. The method of preparing jerked beef consists in passing the flesh from the quarters, neck, and ribs through one or more vats of brine. It is then stacked with salt in heaps about 10 ft. high. The stacks are undone every day, the meat is hung in the sun for 7 or 8 hours, and the stacks are remade in reverse order. The process lasts from 12 days to a month according to the weather.

Primitive breeds of sheep and their crosses (*Pastoral Rev., 24 (1914), No. 1, pp. 49, 50, figs. 3*).—An account of the crossing of black ewes of Welsh origin, Exmoor-bred Cheviots, and Scotch black-faced ewes with a ram from the island of Soay. It is the purpose of these experiments to furnish information on the problems of the inheritance of color and born reversion, and on the influence of environment on the wool, constitution, and fertility of sheep generally. Illustrations are given of a Manx ram, a representative of a breed that exists in small numbers in the Isle of Man and described as the smallest of breeds; of the Hebridean sheep, originally introduced from Norway; and the Piebald sheep, a breed which has been lost in antiquity.

Breeds of sheep for the farm, F. R. MARSHALL (*U. S. Dept. Agr., Farmers' Bul. 576 (1914), pp. 16, figs. 10*).—This discusses the breed characteristics and utility value of the various breeds of middle-wooled and long-wooled sheep.

Mutton, T. G. PATERSON (*Univ. Minn., Dept. Agr. Ext. Bul. 45, pp. 16, figs. 27*).—This is a popular bulletin treating of the dressing and preparation of mutton for market and table purposes.

The Angora goat, L. L. HELLER (*U. S. Dept. Agr., Farmers' Bul. 573 (1914), pp. 16, figs. 6*).—This treats of the advantages, origin, distribution, breed characteristics, utility value, feed, care, and management of Angora goats, and the value and use of mohair. A score card for Angora goats is included.

The utilization of skim milk and potatoes by feeding to pigs, HANSEN (*Mitt. Ver. Deut. Schweinezüchter, 20 (1913), No. 13, pp. 264–268; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1913), No. 8, pp. 1264, 1265*).—German pig-feeding methods are discussed, in which 10-week-old pigs are given a feed composed of barley, meat, and fish meal, equal parts. At the age of from 20 to 24 weeks they reach a weight of 237 to 242 lbs., having made a daily gain of about 1.32 lbs. The feeding of skim milk and potatoes to hogs is shown to be a profitable method for pork production.

Advertising stallions and jacks under the Indiana stallion enrollment law, D. O. THOMPSON (*Indiana Sta. Circ. 43 (1914), pp. 8*).—This circular

explains the provisions as to advertising stallions and jacks under the Indiana stallion enrollment law.

Diversified poultry farming, A. L. CLARK (*New Jersey Stas. Circ. 32, pp. 3–16*).—This circular discusses the production of winter eggs, broilers, roasting chickens, capons, day-old chicks, eggs for hatching, fall pullets, and breeding stock, including methods of management.

A new method for the industrial preservation of eggs, M. DE KEGHEL (*Rev. Chim. Indus., 24 (1913), No. 277, pp. 12–18; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1913), No. 4, p. 618*).—A coating material for the preservation of eggs is compounded according to the following formula: Peanut oil 14 gm., palm oil 20, coconut oil 16, prepared lard 47, spermaceti 2, trioxymethylene 1, and powdered thymol 0.05 gm. Before the eggs are coated they should be sterilized with a 0.2 per cent solution of fluorid of silver.

It is stated that eggs preserved in this way had the same appearance and taste after 18 months as fresh eggs. The cost price of the coating material is estimated at 6d. (12 cts.) per 100 eggs, and the total preserving cost at 1s. 8d. per 100 eggs.

Importation of eggs from China, J. E. OLMSTEAD (*Cong. Rec., 51 (1914), No. 49, p. 3538*).—It is stated that there have recently arrived in the markets of the coast cities large shipments of eggs imported from China. These eggs are being sold a few cents under the price of American eggs and are used largely by restaurants and bakeries. It is claimed that such importations may work hardship on the American producer, and that the Chinese eggs are produced under conditions that render them unfit for human consumption.

Pigeon raising, ALICE MACLEOD (*New York, 1913, pp. 113, figs. 2*).—This treats of the feed, care, and management of pigeons for commercial purposes.

DAIRY FARMING—DAIRYING.

Making the dairy pay, N. F. HULL (*New York, Chicago, and Springfield, Mass., 1913, pp. 84, pls. 15, figs. 30*).—A popular treatise on dairy management.

Conformation of cows and milk yield, J. REIMERS (*Abs. in Mitt. Deut. Landw. Gesell., 28 (1913), No. 17, pp. 255–257; Jour. Bd. Agr. [London], 20 (1914), No. 10, pp. 906, 907*).—In a study made of 300 Friesian cattle from 2½ to 3 years old to determine the relation between conformation and milk yield, it was found that "the milk yield increases slightly with increasing length of body until the latter reaches a certain point, after which there appears to be a slight decrease in the yield. Abnormal length of body apparently has the effect of lowering the milk secretion. The milk yield increases with increasing height of crupper, but the increase can by no means be called regular, and a strong connection between the two factors could not be established. Animals with small or with very deep breasts appear to give a smaller yield than animals which are normal in this respect, but the difference was too slight to make the deduction of practical value.

"There is no regular relationship between milk yield and length of hind quarters, or width between haunches, or breadth of pelvis. Animals with normal breadth of pelvis give more milk than those with larger or small breadth of pelvis, but the difference is not important." No relation could be found between the shape of hind quarters and milk yield. The best milkers had the worst thigh, although there was no regular connection between this and yield. See also a previous note (E. S. R., 27, p. 675).

Report of the Dickinson County Cow-Testing Association, O. E. REED (*Kansas Sta. Circ. 35 (1914), pp. 8, figs. 3*).—This circular reports the results

from the first year of a cow-testing association including 134 cows, with an average production of 6,019 lbs. milk and 246 lbs. milk fat, at a net profit of $54.89. Great variations were found in the various animals. The general advantages of cow-testing associations are discussed.

Dairy feeding and the home mixing of feeds, A. S. COOK (*New Jersey Stas. Circ. 7 (rev.), pp. 14*).—This circular explains the principles involved in the balancing of feed rations for dairy cows and illustrates the use of these principles in compounding rations and grain mixtures. A number of desirable grain mixtures that may be fed with the different roughages are suggested.

[Feeding experiments] (*Min. Agr. et Trav. Pub. [Belgium], Off. Rural Reps. et Communs., No. 2 (1912), pp. 160*).—This reports numerous private feeding experiments with dairy cattle conducted on farms throughout France and Belgium.

Comparison of alfalfa hay and alfalfa silage as a feed for dairy cows, G. H. TRUE ET AL. (*Nevada Sta. Rpt. 1913, p. 39*).—In a preliminary trial with 4 dairy cows, 2 fed on alfalfa hay and a grain ration, and 2 on alfalfa silage and a grain ration, it became evident that alfalfa silage alone could not be used as the only roughage, and a portion of the silage was replaced by hay. It was noticed in this connection that while alfalfa silage and alfalfa hay caused constipation, the silage alone resulted in the opposite effect. It is believed from the results obtained from this preliminary experiment that alfalfa silage has no beneficial effect on milk production.

Prickly pear cactus as a feed for dairy cows (*U. S. Dept. Agr. Press Notice, 1914, January 14, pp. 2*).—In experiments conducted by this Department at Brownsville, Tex., in feeding prickly pear cactus to dairy cows, this feed was found to be very palatable and when judiciously fed was in no way detrimental to the cow or her product. From 60 to 100 lbs. of the pear per cow per day appeared to be a satisfactory amount. Larger quantities caused a laxative condition. The pear was found to be low in protein and high in mineral matter, with from 87 to 93 per cent of water.

Compared with other roughages the pear was found to have a relative value for production of milk fat wherein 1 lb. of sorghum hay, sorghum silage, or cotton-seed hulls is equal to 10.1, 3.3, and 8.8 lbs., respectively, of pear. The feeding of pear apparently decreased the total amount of milk fat and the percentage of solids-not-fat, but increased the total yield of milk. The pear produced a higher colored butter than did the dry feed, but the flavor of the milk was not impaired in any way. Cows fed pear appeared to be more sensitive to cold weather than when fed dry feed. Pear-fed cows required but little drinking water. Both spiny and spineless varieties were fed in these trials, but no difference could be detected in chemical composition or feeding values for milk production.

Effect of concentrated feeds on butter (*Mark Lane Express, 111 (1914), No. 4300, p. 295*).—The results of general experience on the effect of concentrated feeds on butter are summarized, particularly crushed barley and barley meals, malt sprouts and brewers' grains, crushed oats, wheat bran, crushed rye and rye offals, crushed maize and maize offals, crushed buckwheat and buckwheat offals, peas and beans, vetches, cotton-seed meal and cake, peanut cake, coconut cake, linseed cake, palm-nut cake and meal, rape-seed oil residues, sesame cake, sunflower cake, meat meal, fish meal, and fresh and dried sugar-beet slices.

Weight of butter (*Maine Sta. Off. Insp. 51 (1913), pp. 77–92*).—Continuing previous work as to short weight butter (E. S. R., 28, p. 879), it is shown that, while there is still much short weight, on the whole an improvement is noted

in the dairy situation. Recommendations to manufacturer, jobber, retailer, and consumer relative to ascertaining the correct weight of butter are given.

A comparison of the microscopical method and the plate method of counting bacteria in milk, J. D. BREW (*New York State Sta. Bul. 373 (1914), pp. 38, pls. 2, figs. 2*).—This bulletin gives the results of comparative studies between the direct microscopic method and the plate method of counting bacteria as applied to market milk. The milk from 37 dairy farms was examined, although the conclusions were based largely on the results obtained from 4 of these in which cases more extensive and detailed examinations were made.

"The microscopical method used in this work consisted in measuring out 0.01 cc. of milk taken directly from a well-shaken sample by means of a specially graduated and accurately calibrated pipette. The drop of milk was deposited on a clean glass slide and spread over an area of 1 sq. cm. with a stiff, straight needle. Duplicate smears of each sample were made on the same slide. The milk was then dried by gentle heat which was obtained by means of a level wooden surface over a steam radiator. Care was exercised not to allow the smears to become too hot as this made them check and thereby made satisfactory staining impossible. As soon as dry, the slides were placed for a short time in a Coplin staining jar containing xylol to remove the fat. They were then taken out and the surplus xylol about the edges of the slide wiped off with filter paper. The smears were dried and then fixed to the slide by means of a 95 per cent solution of alcohol. Immediately thereafter they were stained from 2 to 3 minutes in Loeffler's methylene blue, after which they were decolorized to a light blue in a 95 per cent solution of alcohol. The counting was done under a 1.9 mm. oil-immersion lens."

The results of these studies indicate that there is a well-defined relationship existing between the direct microscopic count and the plate count. This is more apparent in long series of examinations than in short series which renders it impossible in individual samples to establish a definite ratio whereby the results obtained by the one method can be interpreted on the basis of the other method. "The relative differences between the two counts are greater where the bacteria are few in number. In samples of milk showing plate counts of less than 10,000 per cubic centimeter, the count by the microscope shows approximately 44 times as many individual bacteria, or 17 times as many when the clumps and isolated bacteria are counted as units, individual bacteria in the clumps not being counted. In those samples which give a plate count of about 1,000,000 per cubic centimeter, the count made with the microscope shows approximately 5 times as many individual bacteria; or when the isolated bacteria and clumps of bacteria are counted as units the number of these units is slightly less than the number of colonies given by the plate method.

It is concluded that the bacterial count obtained in milk by the direct microscopic method is equally as good if not a better criterion of its bacterial content than the count obtained by the plate method, and has these decided practical advantages: "The number of bacteria can be shown in a given sample of milk within a very few minutes. The apparatus required is less expensive than that required for the plate method and the examinations necessary for commercial grading can be made by men who are not trained bacteriologists. The morphology of the bacteria present may be determined as well as the approximate number present. The microscope frequently shows many bacteria present in samples of milk while agar plate counts from the same samples are low."

It is hoped that this method can be made of practical use to the milk dealer, butter maker, and cheese maker as a means of grading milk according to its

bacterial condition. It is recognized, however, that the adoption of this method would involve a readjustment of present bacteriological standards and for this reason it is not recommended that such changes in standards be made until more comprehensive data have been secured. The practical application of the microscopical method in the examination of dried milk smears has not yet been fully determined, and there are also questions as to how rapidly dead bacteria undergo dissolution in milk and whether they can be distinguished from living ones by means of stains or other technique which must be answered before the technique can be used in a practical way for the examination of pasteurized milk or for milks where many bacteria have died from one cause or another.

Pure milk production and the abortion bacillus, E. C. SCHROEDER (*Amer. Vet. Rev., 44 (1914), No. 4, pp. 467–475*).—In this paper the author points out the prevalence of the abortion bacillus in the milk of dairy herds and the menace to public health of such contaminated milk. It is concluded that it is imperatively necessary to resort to heat as a simple and inexpensive expedient to make all milk safe before it is fed as food.

Fruity or sweet flavor in Cheddar cheese, S. F. EDWARDS (*Centbl. Bakt. [etc.], 2. Abt., 39 (1913), No. 18–19, pp. 449–455, pls. 3*).—This reports a study made of the fruity or sweet flavors which have been found to develop in Cheddar cheese.

Twelve varieties of flavors were determined and their cause ascribed to various torulæ. Studies made of these torulæ under various conditions tend to show that the off-flavor develops early and does not pass off as the cheese gets older; that the torulæ die out eventually, although some were alive at the end of a year; and that the thermal death point of all 12 varieties studied lies between 65 and 70° C. with an exposure of 10 minutes.

Although the chemistry of the flavor production has not been worked upon, it is thought that the flavor is due to the formation of esters during the process of fermentation.

[Dairy laws] (*Boston, 1912, pp. 53*).—This is a manual of the dairy laws of Massachusetts relating to dairy products and their imitations, with a digest of Supreme Court decisions thereon.

Cost of milk inspection (*Cream. and Milk Plant Mo., 2 (1913), No. 4, p. 32*).—Replies from 184 cities in answer to inquiries sent out by the U. S. Department of Agriculture are summarized, and indicated that 22 cities were not spending any money for milk inspection and only 43 spent 5 cts. or more per capita. The average of all cities reporting milk inspection spent 4.4 cts. per capita.

VETERINARY MEDICINE.

Report of the veterinary director general and live stock commissioner for the year ending March 31, 1912, J. G. RUTHERFORD (*Rpt. Vet. Dir. Gen. and Live Stock Comr. Canada, 1912, pp. 480, pls. 29*).—Among the more important papers presented in the appendixes, which take up the greater part of this report, are the report of the pathologist (pp. 71–91) by C. H. Higgins, which includes papers on Tuberculosis in Poultry and Blackhead in Turkeys; report of the first assistant pathologist (pp. 92–99) by S. Hadwen which includes papers on The Life History of *Ixodes angustus*, previously noted (E. S. R., 30, p. 60), Notes on Ticks, and a List of Ticks Captured; report of the second assistant pathologist (pp. 100–102) by E. A. Watson, which deals largely with dourine; Special Report on Hog Cholera (pp. 103–105) by A. E. Moore; The Control and Eradication of Glanders (pp. 115–122) by C. D. McGilvray; the text of the animal contagious diseases act and the regulations made thereunder

relating to quarantine and the control of disease (pp. 149–158); quarantine regulations (pp. 159–183); an address on Bovine Tuberculosis (pp. 335–337) by J. G. Rutherford; Further Report on the Dourine of Western Canada, part I (pp. 465–472) by E. A. Watson; and a paper on Trypanosomes Found in Canadian Mammals (pp. 473–476) by E. A. Watson and S. Hadwen, previously noted from another source (E. S. R., 27, p. 81).

The determination of the minimal lethal dose of various toxic substances and its relationship to the body weight in warm-blooded animals, together with considerations bearing on the dosage of drugs, G. Dreyer and E. W. A. Walker (*Proc. Roy. Soc. [London], Ser. B, 87 (1914), No. B 595, pp. 319–330*).—"In warm-blooded animals of the same species but of different weights dosage must be calculated in relation to the body surface. This result agrees with the conclusion already reached by Moore [E. S. R., 21, p. 581] though on different grounds. This statement is to be explained on the ground that the concentration in the plasma of any given substance administered is dependent on the volume of the circulating blood, which is itself proportional to the body surface in any given species of animal. It follows that in the accurate measurement and standardization of toxic substances and antitoxins it will now be possible to make use of animals of different weights within a given species instead of using only animals of an arbitrarily selected weight, as has hitherto been necessary. Results in dosage calculated from one species of animal can not directly be applied to another species merely by taking surface into due consideration, since tolerance and intolerance are specific characters which are shown to be in many cases independent of the size of the species concerned."

A bibliography of 25 references is appended.

A note on nitrous oxid as an anesthetic in animal experimentation, D. H. Dolley (*Jour. Expt. Med., 19 (1914), No. 4, pp. 372–375, fig. 1*).—"Nitrous oxid, administered by means of the Gatch apparatus, as a preliminary anesthetic to ether has been found to be superior for the dog in rapidity of action, in promotion of ease of handling, and in absence of disorder; the anesthesia may be maintained solely by nitrous oxid in combination with oxygen; it is economical; and its use is instructive to students from closer imitation of current surgical methods."

Poisoning by castor seeds (Ricinus), G. D. Lander (*Vet. Rec., 26 (1914), No. 1341, pp. 614–618*).—Attention is called to the fact that in spite of the well-known dangerous character of the castor oil seed (*Ricinus communis*) it is not uncommonly encountered in horse mixtures and in cakes.

Critical and experimental data in regard to the formation of leukins, R. Schneider (*Arch. Hyg., 75 (1912), No. 4–5, pp. 167–188; abs. in Ztschr. Immunitätsf. u. Expt. Ther., II, Ref., 5 (1912), No. 9, p. 157*).—This is a discussion of the work of Pettersson and his coworkers. The endolysins obtained by Pettersson are considered secretory products which correspond to the leukins, and the results obtained by Pettersson do not discredit those reported by the author because other technique was used.

Digesting leucocytes in a 5 per cent serum-sodium chlorid (0.85 per cent NaCl solution) at body temperature is deemed the best method for obtaining bactericidal substances from the guinea pig. Serum is added for the purpose of stimulating the leucocytes to yield the bactericidal substances. The bactericidal substances can only be obtained from dead leucocytes when the cell structure has been thoroughly disintegrated.

Bacteria, M. Schottelius, trans. by H. Geoghegan (*London, 1912, 2. ed., pp. XII+324, pls. 10, figs. 33*).—This small book contains chapters as follows: Position of bacteria in the scheme of nature and in regard to other forms of

life; bacteriological research methods; disease and the means of combating infections diseases; immunity and protective inoculation; infectious diseases; and protozoa as pathogenic organisms. The subjects are discussed chiefly from the human medical standpoint.

The present status of our knowledge of the pathogenic rôle of helminths, B. GALLI-VALERIO (*Centbl. Bakt. [etc.], 1. Abt., Ref., 61 (1914), No. 4, pp. 97–115*).—A review with references to the literature on the subject.

The sporotrichoses. DE BEURMANN and GOUGEROT (*Les Sporotrichoses. Paris, 1912, pp. 852, pls. 8, figs. 181*).—The first part of the work (pp. 41–192) consists of a comparatve study of the sporotrichoses and the Sporotrichum pathogens, their botanical classification, etc. The second part (pp. 195–809) relates to the sporotrichosis of de Beurmann, its frequency and geographical distribution, the etiology and pathogeny of sporotrichoses, clinical forms, a study of the localizations of sporotrichosis, polymorphism and multiplicity of forms, evolution, diagnosis, prognosis, treatment, pathological anatomy, experimental sporotrichoses, spontaneous sporotrichoses of animals, etc. A bibliography of 24 pages is appended.

Argas and spirochetes, E. MARCHOUX and L. COUVY (*Ann. Inst. Pasteur, 27 (1913), No. 8, pp. 620–643*).—This second part of the paper previously noted (E. S. R., 29, p. 563) deals with the virus in the tick.

Concerning the filterability of Spirochæta duttoni, J. L. TODD and S. B. WOLBACH (*Jour. Med Research, 30 (1914), No. 1, pp. 27–36*).—"*S. duttoni* in an infective form can be forced through a Berkefeld filter by pressures of over 50 lbs. to the square inch. *S. duttoni* can not be filtered through a Berkefeld filter in an infective form by atmospheric pressure."

The cultivation of a free living filterable spirochete (Spirochæta elusa; new species).—A preliminary report, S. B. WOLBACH and C. A. L. BINGER (*Jour. Med. Research, 30 (1914), No. 1, pp. 9–22, pls. 3*).—This relates to studies of a spirochete developed from the filtrate of pond water to which the name *S. elusa* is given.

"The chief importance to be attached to the cultivation of the spirochete here reported lies in its morphological similarities to the pathogenic spirochetes and in its filterability. The ease with which it is cultivated offers opportunities for the determination of the nature of the coiled and sporelike forms and the granules. The fact that this spirochete forms definite colonies on solid media, similar in appearance to the colonies formed by bacteria, will undoubtedly be taken as evidence for the close relationship between spirochetes and bacteria.

"The filterability of this spirochete, together with positive filtration experiments recorded for relapsing fever spirochetes by Novy and Breinl, and by Todd [see above], indicate that by this method a means may be found for separating spirochetes from bacteria which should open the way to the systematic study of free living spirochetes and those saprophytic in man and animals."

The distribution and morphology of Spirochæta duttoni and S. kochi in experimentally infected ticks (Ornithodorus moubata), S. B. WOLBACH (*Jour. Med. Research, 30 (1914), No. 1, pp. 37–48, pls. 3*).—"The modified Giemsa stain employed is a reliable method of demonstrating spirochetes in the tissues of ticks. The two strains of spirochetes studied, *S. duttoni* and *S. kochi*, migrate through all the organs and tissues of the ticks. Multiplication of spirochetes does not take place in epithelial cells of the tick, but does occur in tissues of the connective tissue group. The minute granules and comma bodies found in epithelial cells, and probably those in other tissues, are not stages in the development of spirochetes. Large granules, coiled and encysted forms derived from spirochetes, occur in various connective tissue structures, and may pos-

sibly represent resting or multiplication stages. By virtue of the power to invade tissues, the spirochetes studied may be transmitted in any secretory or excretory product of infected ticks."

Multiplication in Triatoma infestans of the mal de caderas trypanosome, A. NEIVA (*Abs. in Bul. Inst. Pasteur, 12 (1914), No. 1, p. 46*).—The author records the occurrence of mal de caderas in the States of Bahia, Pernambuco, Piauhy, and Goyaz. Tabanids of the genus Chrysops are thought by the author to be largely concerned in the transmission of *Trypanosoma equinum* in central Brazil. The feces of the reduviid *T. infestans* have been found to be infective.

A note on the pathogenicity of Trypanosoma lewisi, W. H. BROWN (*Jour. Expt. Med., 19 (1914), No. 4, pp. 406–410*).—"Some strains of *T. lewisi* may at times produce rapidly fatal infections in a large percentage of the rats infected. In such strains of *T. lewisi*, a sufficient degree of pathogenicity may persist to warrant the designation of these strains as pathogenic. The pathogenicity of a given strain of *T. lewisi* is not constant, but is subject to marked and even sudden variations."

Anthrax vaccination in Japan, N. NITTA (*Bul. Inst. Infect. Diseases Anim., Japan, No. 1 (1913), pp. 49*).—Anthrax is widespread in Japan and occurs each year in various parts of the country, including Korea. According to the official statistics that have been collected during 25 years (1887–1911), about 12,259 cases have occurred. In many other instances the presence of the disease has not been reported.

In the tests some of the vaccines were made by the Pasteur method, and an anthrax spore vaccine according to the method of Chienkowsky, Lange, and Deutsch. The spore vaccine remained active from 2 to 4 years. Preliminary experiments were made with rabbits, pigs, sheep, calves, and horses.

The practical results obtained with Deutsch's spore vaccine prepared by the author and also with Sobernheim's serum-simultaneous method are reported. In 1905, 144 animals, i. e., 139 bovines and 5 horses, were vaccinated with Deutsch's vaccine; only 1 horse was lost. In 1908, 27,310 bovines and 3,886 horses received spore vaccine, and only 1 horse died from spontaneous anthrax. Of the bovines 96.69 per cent showed no systemic reaction or only a local reaction; 3.26 per cent, a local reaction with a rise in temperature; and 0.01 per cent only a rise in temperature. Observations on the remaining 11 animals could not be taken. Of the horses 98.74 per cent showed either no reaction or only a local reaction; 1.21 per cent, a rise in temperature and a local reaction; in 0.05 per cent the reaction was not determined.

Anthrax serum was found to have both protective and curative powers for both man and animal. The protective powers, however, last only a few weeks, and in order to increase the efficiency of the serum a dose of vaccine should follow its administration.

The number of animals vaccinated in 1904 according to the serum-simultaneous method of Sobernheim was 3,615, consisting of 2,350 bovines and 1,265 horses. Of the bovines 94.3 per cent gave no general or only a local reaction; 2.98 per cent gave a local reaction and a rise in temperature; 2.68 per cent, a rise in temperature only; and with one animal no observation could be taken. Of the horses 99.05 per cent gave no reaction or only a local one; 0.79, a local reaction and a rise in temperature; and 0.16 per cent, only a rise in temperature.

The animals vaccinated since 1909 consisted of 347 goats and 269 hogs. No losses resulted from the vaccinations but one goat died of spontaneous anthrax. Of 77 animals treated with serum alone, 57, or 74 per cent, survived.

Ascoli's method is considered the best for the valuation of anthrax sera.

The diagnosis of glanders, J. R. MOHLER and A. EICHHORN (*Amer. Vet. Rev., 44 (1914), No. 4, pp. 437–447, figs. 2*).—This work emphasizes the value of the mallein eye test as a first-hand means of the veterinarian for diagnosing glanders in horses. The test is deemed simple, practical, and comparatively accurate. The complement fixation test, when used in conjunction with the agglutination test, is regarded as the best laboratory method today, especially since the conglutination test (E. S. R., 28, p. 478) and the precipitation test have been found to be unreliable.

The laboratory methods are deemed a valuable means for substantiating the findings obtained by the practicing veterinarian with the ophthalmic test, especially where a certain amount of doubt exists. "The Bureau of Animal Industry, in consideration of the favorable results obtained from this test, has decided to recognize the [eye test] for interstate shipments of equines, . . . Horses offered for shipment to Canada must continue to be tested by the subcutaneous method, as the ophthalmic test has not yet been officially recognized by the Canadian authorities. . . . It has been employed by inspectors of the Bureau of Animal Industry in their field work, and reports are accessible regarding its action for diagnostic purposes on more than 8,000 cases. The results from all sources were uniformly satisfactory."

One of the most essential features for the success of the test is to employ a mallein of the proper concentration. The presence of 0.5 per cent of carbolic acid in the concentrated mallein as a preservative does not interfere with the test. The crude mallein is preferred to the dried mallein.

The method of making the test and the precautions to be taken are described in detail. In the appendix the results obtained with the test in Austria are discussed.

Immunization tests with glanders vaccine, J. R. MOHLER and A. EICHHORN (*U. S. Dept. Agr. Bul. 70 (1914), pp. 13*).—"The results obtained by these investigations appear to be sufficient to demonstrate the unsatisfactory results of this method of immunization. Of the 13 immunized animals, 9 contracted the disease from natural exposure, which is a large proportion when it is considered that all animals were aged and kept most of the time during the exposure out of doors. Of the 4 remaining immunized horses, 1 died of impaction after the second vaccination, while the other 3 animals were killed . . . in order to ascertain by post-mortem examination the possibility of glanders existing in these animals which had given positive serum reaction, but which had returned to normal."

The occurrence of tubercle bacilli in the circulating blood, A. ROTHACKER and CHARON (*Centbl. Bakt. [etc.], 1. Abt., Orig., 69 (1913), No. 7, pp. 478–496*).—The results of the test show that the Stäubli-Schnitter method gives microscopical preparations which contain acid-fast bacilli other than tubercle bacilli. Many artifacts are also produced which are often mistaken for the tubercle bacillus. According to this, the only criterion for judging the presence of tubercle bacilli is the animal test.

Of the 46 specimens of blood examined, taken during all stages of the disease, only one, a case of miliary tuberculosis, gave a positive animal test. On the other hand, 12 cases showed with the Ziehl-Neelson method acid-fast bacilli which gave suspicions of being of tuberculous origin. The amount of these organisms was always in proportion to the gravity of the disease.

A bibliography comprising 68 titles is appended.

Tubercle bacilli in the blood, JANE L. BERRY (*Jour. Infect. Diseases, 14 (1914), No. 1, pp. 162–175*).—"Notwithstanding the large number of investigators who have made a study of the presence of tubercle bacilli in the circulating blood, it is nevertheless a fact that the most striking point about the

results so far obtained is the total lack of agreement between the reports of the different workers." "As a preliminary to this work, examinations of blood taken from normal animals and human beings were made. In this way specimens from 13 horses, 9 goats, and 3 laboratory workers were examined with negative findings in all cases."

In the main experiments blood was obtained from patients (human beings) giving a history of tubercle bacilli in the sputum. The Kinyoun ligroin method was used for the determination of the tubercle bacilli. "In all, blood specimens were taken from 50 tuberculous patients, 2 specimens obtained from 1 individual, 1 month apart, making a total of 51 specimens examined. Of these, 13 were from patients in the second stage, and 38 from patients in the third stage of the disease, 4 of the latter being bed patients. Six patients have since died, the first 3 at intervals of from 17 days to 1 month, the last 3 in from 1 month to 5 weeks after the taking of the blood specimens."

Careful search was made for tubercle bacilli but in all cases the results were absolutely negative and no acid-fast organisms of any kind were found in the smears. A few rods were occasionally seen but never any which showed acid-fast staining properties. "Owing to the invariably negative microscopic results, no animals were inoculated, as it had been thought best to wait for some positive indications from the microscopic work before beginning animal tests."

A review of the literature is embodied in the article.

The elimination of tubercle bacilli in the feces of tuberculous bovines, C. TITZE, H. THIERINGER, and E. JAHN (*Arb. K. Gsndhtsamt., 45 (1913), No. 1, pp. 1–34*).—Following a review of the literature on this subject, especially of the work reported by Schroeder and Cotton (E. S. R., 19, p. 181), the insufficiency of information relative to how often the feces of bovines, showing no signs of clinical tuberculosis but giving a tuberculin reaction, eliminate tubercle bacilli is emphasized.

In the experiments reported by the authors it was necessary to use the antiformin method because the feces were found to contain other micro-organisms which often caused the untimely death of a number of guinea pigs. Some of these were Gram-positive and resembled the micro-organisms producing braxy in sheep; others were Gram-negative, among which were some identified as belonging to the coli group, staphylococci, and streptococci. The strength of the antiformin used was a 15 per cent solution, with an exposure of from 2 to 4 hours. The exposure of tubercle bacilli to antiformin for 36 hours did not affect the virulence nor the acid fastness of these organisms.

The feces from 96 bovines were tested for the presence of tubercle bacilli, and the results show that under certain conditions tubercle bacilli may be eliminated with the feces of tubercular animals having open pulmonary tuberculosis. This is probably due to these animals swallowing some of the sputum and passing the bacilli per rectum. In animals giving only a tuberculin reaction and showing no clinical evidence of tuberculosis, tubercle bacilli were never found in the feces, therefore the conclusions of Schroeder and Cotton and of the British commission (E. S. R., 21, p. 481) could not be confirmed. Pigs are deemed more easily infected by the droppings of tubercular bovines than bovines themselves.

The detailed protocols of all the experiments are given in the article.

Protecting influence of protein diet against tuberculosis, O. HORNEMANN and E. THOMAS (*Deut. Med. Wchnschr., 39 (1913), No. 48, pp. 2345, 2346; abs. in Jour. Amer. Med. Assoc., 62 (1914), No. 2, p. 169*).—Young pigs fed systematically with casein were much more resistant toward the disease conveyed by

inoculation with tubercle bacilli than other pigs of the same litter fed with carbohydrates and fat.

Experiments regarding the vaccination of cattle against tuberculosis by the intravenous injection of tubercle bacilli of the human and avian types, J. M'FADYEAN, A. L. SHEATHER, J. T. EDWARDS, and F. C. MINETT (*Jour. Compar. Path. and Ther., 26 (1913), No. 4, pp. 327–390, figs. 3*).—The chief purpose of the experiments was to test the efficiency of intravenous injections of the avian type of tubercle bacilli in immunizing cattle against bovine tubercle bacilli. For comparison, some animals were vaccinated with tubercle bacilli of the human type. The conclusions drawn from the work are as follows:

"By the intravenous inoculation of avian tubercle bacilli it is possible to confer on healthy calves a markedly increased power of resistance to infection with bacilli of the bovine type. Such a method of vaccinating young cattle against tuberculosis involves little or no risk to the animals. When the vaccination of young cattle against tuberculosis is considered advisable, avian bacilli should be preferred to human, in order to avoid the danger of infecting human beings with bacilli persisting in the bodies of the vaccinated animals and passed out with their milk.

Piroplasmosis and anaplasmosis, DESCAZEAUX (*Bul. Soc. Cent. Méd. Vét., 91 (1914), No. 4, pp. 103–106*).—In the State of Sao Paulo, Brazil, these diseases constitute a veritable plague for imported cattle, the mortality from the two diseases at times being as high as from 80 to 95 per cent. Piroplasmosis is caused entirely by *Piroplasma bigeminum* and anaplasmosis by *Anaplasma marginale* and *A. centrale*, both of the latter causing forms which are nearly always fatal. Piroplasmosis is widespread throughout the State, while anaplasmosis exists only in certain limited regions. The information at hand shows that anaplasmosis has been introduced into the State of Sao Paulo with imported animals. Immunity measures are discussed.

The etiology, pathology, and therapeutics of bovine piroplasmosis in the State of Sao Paulo, J. DESCAZEAUX (*Bul. Soc. Cent. Méd. Vét., 90 (1913), No. 22, pp. 392–410, figs. 4*).—It is stated that trypanblue when injected subcutaneously always has a curative effect in artificial cases of piroplasmosis but that in cases naturally contracted it is not always efficacious. The autoagglutination of erythrocytes always precedes the appearance of piroplasms in the blood. The gravity of the affection is not dependent upon the number of piropalsms but upon their virulence.

Report on the use of salvarsan in septic pneumonia of bovines, STEINHAUSZ (*Abs. in Rev. Gén. Méd. Vét., 22 (1913), No. 263, pp. 617, 618*).—During the course of an epidemic of septic pneumonia in valuable animals the author administered salvarsan. From 0.5 to 0.9 grains were used without danger on calves under 3 weeks of age. It is said to have given excellent results and to merit recommendation.

Verminous bronchitis in bovines, G. MOUSSU (*Rec. Méd. Vét., 90 (1913), No. 21, pp. 677–684*).—This disease, due to *Strongylus micrurus*, is said to have caused an enormous loss of cattle in the valleys of the Seine and Loire, France.

Studies of the development of Hypoderma bovis and means for its destruction, A. LUCET (*Compt. Rend. Acad. Sci. [Paris], 158 (1914), No. 11, pp. 812–814*).—A report of studies of the ox warble, which is a source of great loss to agriculturists in France.

Progress and results of cattle tick eradication (*U. S. Dept. Agr., Bur. Anim. Indus., Progress and Results of Cattle-Tick Eradication, 1914, pp. 12*).—This summary of the results obtained in the eradication of *Margaropus annulatus* is based upon about 1,000 replies to a questionnaire carried on among stockmen

and farmers in eleven States in the territory bordering on the quarantine line, being on a larger scale than that previously reported (E. S. R., 27, p. 184).

The parasitic diseases of sheep in the Province of Algiers (*Rev. Sci. [Paris], 52 (1914), I, No. 6, pp. 179, 180*).—A discussion of the various ascarids, flukes, tapeworms, and strongyles affecting sheep in Algeria.

Contribution to the study of necrobacillosis: A specific epizootic form of necrobacillosis in the goat, G. E. PESADORI (*Clin. Vet. [Milan], Rass. Pol. Sanit. e Ig., 36 (1913), No. 18, pp. 816–819; abs. in Vet. Rec., 26 (1914), No. 1339, p. 574*).—This article relates to a contagious affection of the claws of goats which appeared in Calabrian districts at the beginning of the winter of 1912–13, some 10,000 animals being affected in the course of 2 months. Sheep and cattle kept under the same conditions as the goats and constantly exposed to the infection remained free from the disease. The necrosis bacillus, which gains entry into the organism through lesions in the horn and in the cleft of the claws, is thought to have been the cause.

Hog cholera, R. A. CRAIG and R. A. WHITING (*Indiana Sta. Bul. 173 (1914), pp. 441–474, figs. 18*).—A general account of hog cholera with hygienic preventive measures and treatment, including the preparation and administration of antihog cholera serum. The text of the state law relative to swine diseases is appended.

Combating hog cholera by vaccination, PFEILER (*Mitt. Ver. Deut. Schweinezüchter, 18 (1911), No. 7, pp. 103–110*).—In this lecture it is pointed out that the disease caused by the filterable virus is more serious than the one produced by the *Bacillus suipestifer voldagsen*. It probably is a different disease and Dammann (E. S. R., 24, p. 390) according to the author, has satisfied himself to this effect.

The various facts surrounding the vaccination of hogs with antihog cholera serum and the cause of the disease are discussed with much detail and in a popular manner.

[Hog cholera], UHLENHUTH (*Mitt. Ver. Deut. Schweinezüchter, 18 (1911), No. 7, pp. 110–113*).—While corrosive sublimate and carbolic acid do not kill hog cholera virus in a comparatively short time, a 6 per cent cresol soap solution, or a 1:6 or 1:20 per cent calcium hypochlorite solution will destroy it within 1 hour. The virus is very resistant to cold but drying at a temperature of 78° C. will destroy it. Heating for one-half hour at 58° does not render it avirulent. When inclosed in fermenting manure the virus dies.

Hogs which have recovered from an attack of the disease but which are otherwise in an unsatisfactory condition are often found to be virus carriers. The urine of young pigs is especially dangerous and is often the chief cause of the spread of the disease. The secretion from the eyes and nose is very dangerous, for this may be inhaled or may come in contact with the mucous membrane of healthy animals, thus causing the disease.

The material with reference to the *Bacillus suipestifer*, which is considered a secondary invader, has been adequately noted from other sources (E. S. R., 20, p. 1082; 25, p. 589). See also other notes (E. S. R., 26, p. 785).

Investigating the infectious diseases of the hog, PFEILER (*Mitt. Ver. Deut. Schweinezüchter, 19 (1912), No. 7, pp. 138–145*).—This discusses the possibility of using chemotherapeutic agents, especially in the chronic form of hog cholera.

While the filterable virus as a cause of hog cholera is not doubted, many cases of what seem to be hog cholera do not show the presence of a filterable virus. These cases often have present the *Bacillus suipestifer* and closely related organisms.

Much can be said with reference to the need of accurate diagnosis of hog cholera because there are often cases in which it is difficult to decide whether it is hog cholera or swine plague.

The above is discussed by Wassermann, Händel, and Lehmann.

The relation of shoat typhoid to virus hog cholera. W. Pfeiler and R. Standfuss (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 14 (1913), No. 7, pp. 409–421*).—Uhlenhuth and his school hold that the *Bacillus voldagsen* is simply a secondary invader and only a variety of the *B. suipestifer* (Salmon and Smith). Shoat typhoid and hog cholera are diseases caused by entirely different factors. Shoat typhoid is of greater significance than is usually supposed. The disease is present in numerous instances in many places in Germany and other portions of the European Continent.

In some previous tests (E. S. R., 28, p. 183) it was shown that shoats immunized passively against hog cholera and unimmunized shoats became infected with shoat typhoid when fed with the *B. voldagsen*. As passive immunity lasts only a relatively short time, the authors in the present investigation thought it best first to immunize passively and then to infect the animals with virus in order to produce an active immunity toward hog cholera. Accordingly four pigs about 8 weeks old, having weights up to 25 kg., received a primary injection of 10 cc. of serum and 2 cc. of vaccine I (Gans), and 14 days later an injection of 3 cc. of vaccine II. Whether hogs can be immunized actively against hog cholera by this method is to be discussed in another paper. However, three of the pigs did not take the disease, although two received one-eighth of a loopful of the culture of the *B. voldagsen* and the remainder were kept in the same corral with infected animals; one of the latter group died after 6 weeks and came to autopsy. The results seemed to indicate that pigs immunized against hog cholera are immune to pig typhoid.

On this account the experiments were repeated with eight pigs, four being immunized against hog cholera and the remainder kept as controls. All of the animals were exposed to the natural source of infection. One of the four unimmunized animals died within 12 days from unknown causes, no changes being noted in the organs. Another did not become sick but was used later for some other tests and eventually died of hog cholera. No changes characteristic of hog typhoid were present, but from its organs the *B. voldagsen* was obtained. The remaining two animals of the group remained sound. Of the pigs immunized passively-actively against hog cholera three became sick with pig typhoid. One died of typhoid, another was slaughtered, a third was backward in growth, and died 4 months later as the result of virus infection but with lesions characteristic of pig typhoid. The fourth was also stunted in growth and was probably affected with typhoid.

The above tests, according to the authors, emphasize the fact that shoat typhoid can occur without a previous primary infection with hog-cholera virus and that it is due to an independent pathogenic organism. This disease must be considered an entity different from hog cholera.

Forage poisoning or equine encephalomyelitis, A. T. Kinsley (*Proc. Amer. Vet. Med. Assoc., 50 (1913), pp. 413–438, pls. 2*).—A general discussion of the subject with references to the literature.

The etiology of equine influenza, L. Panisset (*Rev. Gén. Méd. Vét., 22 (1913), No. 263, pp. 606–612*).—A review of recent literature on the subject.

The treatment of equine pneumonia with iodocol, E. Houdemer (*Rev. Gén. Méd. Vét., 22 (1913), No. 257–258, pp. 217–221, figs. 4; abs. in Ann. Méd. Vét., 62 (1913), No. 12, pp. 689, 690*).—It is stated that the daily injection of 5 cc. of iodocol for 6 days results in rapid improvement, the temperature ordinarily dropping after the second injection. The iodocol appears to have special elec-

tive action on the lungs and a remarkable action on the fever. It is said to be a sterile isotonic solution of free and pure iodin in the colloidal state, which may be purchased in ampoules of 1, 2, 5, or 10 cc. The injections may be made hypodermically, intramuscularly, or intravenously, the last-named method being preferable.

Poultry diseases and their treatment, B. F. KAUPP (*Chicago, 1914, pp. 185, figs. 56*).—This is intended to fill a demand for a book on poultry diseases for veterinary and poultry husbandry students and for veterinary practitioners. The chapter headings are as follows: Anatomy, sanitation, external parasites, internal parasites, diseases of the digestive tract, diseases of the blood, constitutional diseases, diseases of the liver, diseases of the ovary and oviduct, tumors, diseases of the respiratory passages, disease of the legs and feet, diseases of the brain, bacteria of the intestinal tract of chickens, the egg, isolation of nonlayers, malformations and fractures, wounds, and anesthesia.

Investigations of the filterable virus of avian diphtheria and contagious epithelioma of birds, S. VON RÁTZ (*Monatsh. Prakt. Tierheilk., 25 (1913), No. 1–2, pp. 41–46*).—The introduction of the virus from diphtheritic pseudomembranes of the throat into the scarified skin produced pathological changes characteristic of epithelioma and, inversely, the introduction of particles of epitheliomatous tumors into the mucosa of the mouth and pharynx produced diphtheritic lesions. In later experiments here reported, in which filtrates of emulsified substances from a Nordtmeyer-Berkefeld filter were used, similar results were obtained.

The author concludes that these affections of fowls are only two forms of a disease of which the causative agent is a filterable virus.

RURAL ENGINEERING.

Report of proceedings of the seventh annual convention of the Western Canada Irrigation Association (*Rpt. Proc. Ann. Conv. West. Canada Irrig. Assoc., 7 (1913), pp. 204, pls. 3, figs. 32*).—Some of the special articles in this report are as follows: The Work of the International Irrigation Congress, by A. Hooker; Irrigation Practice in Utah, by R. H. Lyman; Irrigation Practice in Oregon, by J. H. Lewis; The Irrigation Farmer, by W. Huckvale; Colonization and the Irrigator, by J. T. Hinkle; Irrigation and Immigration, by J. S. Dennis; Conservation and Irrigation, by J. White; Government Education Along Irrigation Lines, by W. J. Elliott; Forestry and Irrigation, by R. H. Campbell; Irrigation and Land Settlement in Australia, by J. W. A. Kelly; and Live Stock and Irrigation, by H. C. McMullen.

Preliminary report on ground water for irrigation in the vicinity of Wichita, Kansas, O. E. MEINZER (*U. S. Geol. Survey, Water-Supply Paper 345–A (1914), pp. 9*).—This paper, the first of an annual volume to be entitled Contributions to the Hydrology of the United States, gives an outline of the geology of the Wichita region with especial reference to its water resources. Types of wells and well casing methods are briefly discussed, and a table of partial analyses of the ground waters in the vicinity of Wichita is given which shows "that although the ground waters are generally somewhat hard and otherwise mineralized they differ widely in the quantities of mineral matter that they contain. . . . A large proportion of the samples analyzed represent waters that are satisfactory for irrigation use, but a few of the most highly mineralized samples approach the danger line, especially in their content of common salt. However, with the relatively humid conditions that prevail in this region and the consequent dilution and leaching that will result from the rain water, injury from the salt in even the more highly mineralized waters

need not be feared except where the soil is clayey or already impregnated with alkali."

As regards the adequacy in quantity for irrigation of the water supplies "the danger of exhausting the supply is believed to be so remote that it need not prevent anyone from making developments that will otherwise be profitable."

The items to be included in estimating the annual cost of irrigation are enumerated and it is thought "that with good management, both in regard to pumping and in regard to agricultural or horticultural practice, irrigation can be made profitable for raising vegetables and certain fruits and probably also alfalfa and some other field crops. . . . [However] because of the lack of quantitative knowledge as to the increase in crop values that will in the long run result from irrigation, this movement should be prosecuted with conservatism and developments should be made only after deliberate consideration of all the factors involved."

A bibliography is appended.

The diversion of irrigating water from Arizona streams, A. L. HARRIS (*Proc. Amer. Soc. Civ. Engin., 40 (1914), No. 1, pp. 39–58, figs. 5*).—This paper deals with the principal features in the author's experience in the design of diversion works for both government and private irrigation projects in Arizona. The chief points discussed are the design of diverting dams and gates.

Hydraulic power in the Alps region, R. DE LA BROSSE ET AL. (*Min. Agr. [France], Serv. Grandes Forces Hydraul. Région Alpes, Result. Etudes et Trav. 4 (1910), pp. 556, pls. 6, figs. 14; Sups. I, pls. 8; II, pls. 33; 5 (1911), pp. 530, pl. 1, figs. 4; Sup., pls. 8; 6 (1911), pp. 494, pl. 1, figs. 14, Sup., pls. 44*).—This report deals with the hydraulic resources of the Alps for both power and irrigation, and contains a large amount of hydraulic and hydrographic data.

Comparative studies of problems of agricultural hydraulics in Java, British India, and Indo China, A. NORMANDIN (*Bul. Econ. Indochine, n. ser., 16 (1913), No. 104, pp. 784–810*).—This is a comparative study of economic problems, more particularly of the irrigation and drainage of lands in Java, British India, and Indo China, taking up particularly the necessity of irrigation, finished and projected work, duty of water, irrigation by pumping, general irrigation investigations, and the several phases of drainage. It is concluded that the works of agricultural hydraulics projected in Indo China will probably be neither excessive in cost nor a source of direct benefit, and that the benefit derived will in no way compare with the benefits derived from similar works executed in British India.

Drainage and irrigation.—Management of irrigation systems, R. S. STOCKTON (*Engin. and Contract., 41 (1914), No. 4, pp. 141–150, figs. 11*).—This article expresses opinions and ideas "resulting from some years of observation and experience in connection with the construction, operation, and maintenance of irrigation systems with especial reference to the viewpoint of the management."

The selection and cost of a small pumping plant, B. A. ETCHEVERRY (*California Sta. Circ. 117 (1914), pp. 30, figs. 8*).—This bulletin contains in addition to matter previously noted from other sources (E. S. R., 28, pp. 83, 484; 30, p. 485), brief discussions of types of pumping machinery, including the air-lift pump and hydraulic ram. A bibliography of related works is appended.

The discharge capacity of semicircular steel flumes, E. A. MORITZ (*Engin. News, 71 (1914), No. 4, pp. 192–195, fig. 1*).—The author computes mathematically the discharge capacity of semicircular steel flumes, and gives tables of the discharges and corresponding velocities for standard sizes calculated by the Kutter formula for values of n of 0.012 and 0.015, which he states correspond to the smoothest and roughest flumes, respectively. The tables are based on a

freeboard of 1 in. for each foot in diameter. By a mathematical analysis he shows that "any semicircular flume will carry 36 per cent more when running full than when running with a freeboard of 1 in. per foot of diameter."

Examples are given to illustrate the use and flexibility of the tables.

Corrugated iron construction on the Sacramento Valley irrigation project, E. C. MILLS (*Engin. News, 71 (1914), No. 4, pp. 174–176, figs. 4*).—This article describes the water-distribution structures on this project, which for permanent construction consist only of concrete and corrugated iron or a combination of the two. The features especially emphasized are corrugated pipe headgate construction, corrugated pipe delivery boxes, lateral road crossings, inverted siphons for natural drainage, road drainage structures, and sheet-iron flumes.

A study of economic conduit location, C. E. HICKOK (*Proc. Amer. Soc. Civ. Engin., 39 (1913), No. 19, pp. 2185–2190, figs. 2; Engin. and Contract., 41 (1914), No. 2, pp. 80, 81, fig. 1; Engin. Rec., 69 (1914), No. 3, pp. 83, 84, figs. 2*).—This article includes a diagram which gives the equivalent lengths from an economic standpoint of various types of conduits and a discussion of its application in the economic location of conduits.

A treatise on roads and pavements, I. O. BAKER (*New York and London, 1913, 2. ed., enl., pp. 698, figs. 171*).—The object of this book is to give a discussion from the point of view of the engineer of the principles involved in the construction of country roads and city pavements. It is attempted to show that the science of road making and maintenance is based upon well established elementary principles, and that the art depends upon correct reasoning from the principles rather than in attempting to follow rules or methods of construction. "In some cases practical experience has not yet determined the best method of procedure, and in these cases the conflicting views with the reasons for each are fully stated."

Considerable space is given to the economics and location of country roads and to the construction and maintenance of earth roads. The topics discussed are road economics, road location, earth roads, gravel roads, broken-stone roads, miscellaneous roads, equestrian roads and horse-race tracks, pavement economics, street design, street drainage, curbs and gutters, pavement foundations, asphalt pavements, brick pavements, cobblestone pavement, stone-block pavement, wood-block pavements, comparison of pavements, sidewalks, bicycle paths and race tracks, and automobile roads and concrete pavements.

A glossary of road terms, H. P. BOULNOIS (*Surveyor, 44 (1913), Nos. 1136, pp. 621–626; 1137, pp. 663–667; 1138, pp. 700, 701; 1139, pp. 728–730*).—This is a compilation of terms which are used in connection with English road construction.

The principles of the application of power to road transport, H. E. WIMPERIS (*London, 1913, pp. XV+130, pls. 5, figs. 20*).—This work deals with the principles of the application of power to road transportation.

A general survey of the subject, taking up the use of steam, internal combustion, and electrical power for transportation, and discussing necessary power per ton mile and resistance to motion relative to loads, speeds, wheel diameters, tires, etc., is followed by a discussion of power, speed and resistance measurement, road tests, and power loss in engine friction and in transmission. Types of steam and internal combustion engines and vehicles on which they are used are described, and the relationship of engine dimensions and gear ratios to work and the proper design of vehicles are discussed in some detail.

Experimental road construction in Scotland, J. W. SMITH and D. RONALD (*Surveyor, 45 (1914), No. 1147, pp. 44–49, figs. 4*).—A draft of specifications and conditions for this work is given.

Test of a 40-ft. reinforced concrete highway bridge, D. A. ABRAMS (*Amer. Soc. Testing Materials Proc., 13 (1913), pp. 884–922, figs. 24*).—A 3½ years' test of a 40-ft. reinforced concrete through-girder highway bridge with an 18-ft. roadway, in which the bridge sustained unusual and excessive loading, is reported in detail.

Some properties of building materials, B. F. E. KEELING (*Cairo Sci. Journ., 7 (1913), No. 80, pp. 97–103, fig. 1*).—In this article the results of experiments on the physical properties of sand-lime bricks and of walls made with them, and also on some other properties of buildings, are reported.

Results obtained with the autoclave tests for cement, H. J. FORCE (*Amer. Soc. Testing Materials Proc., 13 (1913), pp. 770–796, figs. 8*).—This paper gives the results of comparative tests of various brands of cement, some of which failed to pass and others of which passed the autoclave test previously noted (E. S. R., 28, p. 290).

On the ground that the grinding of the raw material and the proper burning plays a most important part in the quality of Portland cement, the author believes "that the failure of cement to pass the autoclave test is due very largely to the coarser granules which do not become hydrated when the cement is set up, and that the failure of these granules to become fully hydrated is due to their chemical composition, that is, the granules are composed largely of dicalcium silicate with a smaller proportion of tricalcium silicate. Granules of this composition fail to hydrate properly in the period of 24 hours, and consequently when brought in contact with heat and pressure, together with moisture, slaking of the dicalcium silicate is quickly brought about, with the result that a large percentage of expansion occurs together with a proportionate decrease in tensile strength. On the other hand, if the proportion of tricalcium silicate is largely in excess of the dicalcium silicate, then we may expect a more stable product and one which will show considerably less expansion under the autoclave test and which should remain constant in volume in after years."

Tests of natural concrete aggregates, R. S. GREENMAN (*Cement Era, 11 (1913), No. 8, pp. 41, 42; Amer. Soc. Testing Materials Proc., 13 (1913), pp. 828–833*).—Results of tests are reported which indicate that both the laboratory tests and carefully made field tests and inspections of aggregate present ways and means of indicating what the natural aggregate, either fine or coarse, will actually do in the concrete in place.

Fine particles [in cement] estimated by rate of hydration, H. S. SPACKMAN (*Cement Era, 11 (1913), No. 7, pp. 83, 85; Amer. Soc. Testing Materials Proc., 13 (1913), pp. 714–719*).—Tests of a normal cement passing the standard specifications of the American Society for Testing Materials showed a definite relation existing between fineness of grinding on one hand and rate and extent of hydration on the other.

Apparatus for determining consistency [of cement paste], C. M. CHAPMAN (*Concrete-Cement Age, 3 (1913), No. 1, pp. 8, 9, figs. 3; Amer. Soc. Testing Materials Proc., 13 (1913), pp. 1045–1052, figs. 3*).—A method for determining the consistency of neat cement paste consists in depositing the mortar or concrete in a form of suitable size and shape on a glass or metal surface, then removing the form and noting the settling either with or without the assistance of a jar or shock of the unsupported mass. A low form of large area is used for soft wet mixtures, and smaller, taller forms for drier mixtures.

The limits beyond which the method is useless lie between that consistency which is fluid enough to flow freely, and that which is too stiff to alter its form under the influence of a comparatively light shock.

Thermal activities of Portland cement during the period of setting, L. N. BEALS, JR. (*Amer. Soc. Testing Materials Proc., 13 (1913), pp. 720–739, figs. 9*).—

The peculiarities of curves obtained by platting calories of heat evolved by cement during the period of setting against the time of setting "seemed to indicate that the time of set and tensile strength are due to the colloidal nature of cement. This is seemingly supported by references to the well known characteristics of colloids."

Solubility of cement tile, W. H. DAY (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 38 (1912), pp. 43–45*).—Tests of the solubility of cement tile led to the conclusion that in ordinary soil water there is no danger of dissolving and crumbling in good cement tile which are not weaker in mixture than 1:4, are thoroughly mixed, are of wet mixture firmly packed, are dried slowly during initial set and kept wet for a week, and then well seasoned.

Gas engines and producers, L. S. MARKS and S. S. WYER (*Chicago, 1913, pp. [8]+62+5, pls. 3, figs. 36*).—This is a treatise on the modern development of the internal-combustion motor, and of efficient methods of fuel economy and power production. The work "is designed to present theoretical and practical information in such form as to appeal both to the engineer and to the untrained person who is merely interested in the subject."

The subject matter under the division of gas and oil engines is as follows: The external-combustion motor, the internal-combustion motor, the modern gas engine, thermodynamics of the Otto cycle, ignition, governing, starting, water jackets, the explosive mixture, the exhaust, modification of the Otto cycle, gas-engine fuels, large gas engines, liquid fuels, and kerosene and crude-oil engines. Under the division of gas producers are the topics of gaseous fuels, history and manufacture of producer gas, gasification losses, rules, representative types, gas cleaning, uses of producer gas, producer-gas power plants, and gas poisoning.

A new kerosene carbureter, G. M. HOLLEY (*Gas Engine, 16 (1914), No. 1, pp. 32–34, figs. 3*).—A carbureter is described and diagrammatically illustrated which is so arranged that in starting the engine the mixture consists of both gasoline and kerosene. The gasoline supply is constant and the kerosene supply can be slowly increased until the engine is heated and running smoothly on a high koresene mixture, at which point the gasoline may be cut off. This device is said to accomplish prompt and smokeless starting.

A unique kerosene carbureter, J. A. LUCAS (*Power, 39 (1914), No. 1, pp. 14, 15, fig. 1*).—This article describes and illustrates a kerosene carbureter, so designed that the kerosene mixture when very rich is partially ignited and thereby heated before entering the combustion chamber. From the heating chamber the mixture passes to the mixing chamber, where it is properly proportioned, and then into the combustion chamber. This device is said to allow a motor to start when cold, on kerosene, "apparently as easily as on gasoline," and also to prevent excessive carbonization.

Specifications for motor power spraying machines (*Fruit-Grower and Farmer, 25 (1914), No. 2, pp. 18, 19*).—Specifications for motor spraying machines of several different makes are given in a table.

How to harvest ice rapidly, H. B. WOOD (*Sci. Amer. Sup., 77 (1914), No. 1984, pp. 18, 19*).—The author calls attention to the prime importance of speed in the harvesting of ice and describes methods of saving time and preventing delays.

Destroying stumps with acids, H. C. COGGINS (*Agr. Gaz. N. S. Wales, 24 (1913), No. 11, pp. 967, 968*).—Tests with sulphuric and nitric acids in varying proportions for stump destroying proved unsatisfactory with both dry and green stumps. It is concluded that sound stumps can not be destroyed with either sulphuric or nitric acid, or both. The method is also wasteful of time and the handling of acids dangerous.

Poultry house construction, A. R. Lee (*U. S. Dept. Agr., Farmers' Bul. 574 (1914), pp. 20, figs. 13*).—This points out and explains the essential principles of poultry house construction, contains pictures of houses and fixtures which have given satisfaction in various sections of the country, accompanied by plans, specifications, and bills of material, and gives hints on construction.

A practical farm ice storage house, M. Cooper (*Ohio Farmer, 133 (1914), No. 3, pp. 1, 2, figs. 4*).—This article describes the location, design, and construction of a practical farm ice house.

House heating fuel tests, W. H. Meeker and H. W. Wagner (*Iowa Engin. Expt. Sta. Bul. 33 (1913), pp. 85, figs. 16*).—Tests of coals and cokes commonly used in Iowa for house heating, to determine the fuel cost for developing a definite amount of available heat and the attention required and inconvenience experienced in keeping up heat with different fuels, are reported with test data, tables, diagrams, etc.

The following table is a summary of the average heating costs for the different classes of fuels tried:

Summary of comparative costs with various fuels.

Class of fuel.	No. of tests.	No. of fuels.	Average cost per ton.	Average cost per 1,000 lbs. equivalent evaporative (212° F.).	Annual cost for seven-room house.
				Cents.	
Iowa soft coals	15	6	$3.86	37.4	$64.70
Illinois soft coals	11	5	4.70	40.6	70.10
Other soft coals	3	2	6.87	47.1	81.40
Cokes	6	4	8.50	52.3	90.50
Anthracite	2	2	9.50	61.8	106.90
Iowa peat	1	1	4.50	144.1	249.00
Average			7.96	45.6	78.80

Rural hygiene, I. W. Brewer (*Philadelphia and London, 1913, pp. 233, pls. 13, figs. 9*).—This is the second edition of this work (E. S. R., 23, p. 191).

RURAL ECONOMICS.

The new agrarianism, C. W. Dahlinger (*New York and London, 1913, pp. V+249*).—The author traces the evolution of industry in the United States, explains the fundamental causes of complaints against corporate wealth, describes the condition of agriculture in Ireland, England, Germany, and Denmark, and concludes that the principal factor in promoting agricultural progress is education and satisfactory financial support.

Slav farmers on the "abandoned farm" area of Connecticut, A. E. Cance (*Survey, 27 (1911), No. 1, pp. 951–956, figs. 6*).—The author describes the settlement of Slavic and Jewish immigrants on the Connecticut highlands, and concludes that their general lack of success is due to the exhausted condition of the soil, exorbitant prices paid for the land, isolated location, and the out-of-date system of agriculture.

What farmers use (*Minneapolis, Minn., 1913, pp. 363, figs. 12*).—This book contains data showing the number of farms in Minnesota, the Dakotas, and Wisconsin reporting the use of the various kinds of food, agricultural implements, seed, and live stock.

Information concerning agriculture in Argentina, A. Hermes and H. Holtmeier (*Ber. Landw. Reichsamte Innern, No. 29 (1913), pp. VIII+311, pls. 64,*

figs. 1).—This volume contains a detailed description of the geology, soil, moisture, and climatic conditions, peoples and colonization, systems of cultivation, live stock, agricultural organizations and their improvement, and trade in animal produce, in Argentina, and details concerning a number of typical agricultural establishments. Statistical data, illustrations, and diagrams supplement the text.

An agricultural faggot, R. H. Rew (*Westminster, 1913, pp. XII+187*).—This is a collection of papers on the following subjects relating to English agriculture: Farming in olden times, agriculture under free trade, English markets and fairs, the migration of agricultural laborers, the middleman in agriculture, combination among farmers, cooperation for the sale of farm produce, the nation's food supply, selling stock by live weight, and British and French agriculture.

The determination of the fertilizer requirements of soils, M. Hoffmann (*Arb. Deut. Landw. Gesell., No. 251 (1913), pp. 182, pl. 1, figs. 5*).—This report summarizes the results of experiments with fertilizers on the Calvörde estate from 1869 to 1912 and on a number of other estates from 1907 to 1912. The results are discussed especially from the economic standpoint.

Investigation of the management, organization, and profitableness of a large farm in the black earth region of Volhynia, J. Klein (*Mitt. Landw. Inst. Breslau, 7 (1914), No. 1, pp. 49–200, figs. 11*).—The author discusses the following factors that enter into the management of a farm in the black earth region of Russia: The soil, climate, influence of climate upon yields, proportion of land under different types of cultivation, monthly distribution, kinds, and management of labor, capital invested in land, buildings, animals, and fertilizers, and cost and revenue from various farm crops. Most of the records shown cover a period of more than 15 years.

The agricultural law; its improvement and enforcement, C. J. Hudson (*N. Y. Dept. Agr. Bul. 47 (1913), pp. 1217–1224, pl. 1*).—The author states that the purpose of the laws applying to agriculture in New York is to provide means for making the farms more productive, to search out by rigid inspection diseases of plant and animal life and to prescribe and apply the remedy, to stay the ravages of insect pests, and to perform those numerous things which the farmer, either singly or collectively, is unable to perform for himself. He suggests some improvements that might be made in the laws already existing, and discusses what the rigid enforcement of those already on the statute book would mean.

Can European cooperative credit methods be applied to American farming? E. W. Kemmerer (*N. Y. Dept. Agr. Bul. 47 (1913), pp. 1291–1300, pl. 1*).—The author gives as the reasons for the lack of development of short-term agricultural credit in the United States the system of extensive cultivation, the unsettled character of a considerable part of our agricultural population, the heterogeneous character of many rural communities, and the isolation of our farmers. He concludes that conditions are becoming more favorable for the adopting of this type of credit, but that the initiative in the establishment of rural credit banks should be taken by the farmers themselves and that only a reasonable amount of government supervision seems desirable.

Agricultural accident insurance in Belgium, M. E. Vliebergh (*Internat. Inst. Agr. [Rome], Mo. Bul. Econ. and Soc. Intel., 5 (1914), No. 2, pp. 37–49*).—According to the law passed in December, 1903, the farmer became liable for accidents to his laborers similarly to other classes of employers. In applying the law it became evident that the farmer himself or members of his family needed compensation for accidents as well as his laborers, so there was or-

ganized a mutual insurance society to meet this demand. The author explains the working of these associations, the results obtained, and the changes that are deemed necessary to establish the system on a more equitable basis.

The cooperative insurance of live stock in England and Wales. J. WILSON (*Jour. Roy. Statis. Soc., 77 (1914), No. 2, pp. 145–158*).—The author, in investigating live stock insurance, found that there were in 1911 832 unregistered pig clubs composed of 30,529 members and insuring 53,981 pigs, and in 1912 31 registered pig insurance societies with 1,461 members and 3,066 pigs. From a study of these organizations he concludes that the average death rate was less than 5 per cent and would require an average net income from insurance contributions of less than 2s. per pig per annum.

The experience of 86 cow insurance societies, consisting of 3,579 members and insuring 9,974 cows and calves, showed an average death rate of 2½ per cent and an average loss of less than 5s. per cow per annum.

To guaranty success he advises that the societies maintain a substantial reserve and, if possible, reinsure in some large insurance organization.

The agricultural outlook. C. M. DAUGHERTY, F. ANDREWS, W. J. T. DUVEL, and G. K. HOLMES (*U. S. Dept. Agr., Farmers' Bul. 581 (1914), pp. 50*).—The world's acreage and production of corn, oats, barley, rye, potatoes, and flax are shown by statistical tables for 1911–1913 inclusive, and for every country for which data are available. Accompanying each table is a general discussion of the data shown and the purpose to which the different products are put in the various countries. The imports of corn from Argentina and oats from Canada are thoroughly analyzed.

It is also pointed out that within the last few months the imports of chilled and frozen beef from Argentina have amounted to 9,000,000 lbs. monthly, but this amount adds only a little over 1 per cent to the national supply of the United States. Since a great deal of this meat is imported by Chicago packing house companies having slaughterhouses in Argentina it can not be assumed that they are using Argentina beef to beat down the prices of Chicago beef. The number of cattle in Argentina during the last 5 years has remained about the same. That country can not increase its beef supply permanently until the slaughter actually lessens sufficiently to give its herds opportunity and time to increase.

The efforts of the various European countries to supplement the American cotton crop resulted in the production of slightly over 100,000 bales in 1912. There are many counties in Texas and other States that each produce from ⅓ to ½ of this amount.

Following these discussions is a paper setting forth the crop reporting system and the sources of crop information in foreign countries.

[Stocks of potatoes on hand, January 1, 1914, and world's wheat crop and crop values for 1913], G. K. HOLMES (*U. S. Dept. Agr., Farmers' Bul. 575 (1914), pp. 29–33, 40–43*).—The estimated proportion of potatoes remaining in growers' hands was larger on January 1, 1914, than has been the case in the four years past, and the proportion in dealers' hands smaller than for any year of the last four, except on January 1, 1912.

For the first time on record the world's wheat crop is estimated as over 4,000,000,000 bu.

The value of certain enumerated crops is shown for 1909–1913. These crops comprised 79.4 per cent of the value of all crops taken in the census and increased from $4,357,595,000 in 1909 to $4,905,881,000 in 1913. Statistical tables are given showing by States the value of crops enumerated, rank of each State, and their relative increase or decrease; stocks of potatoes in growers' and in

dealers' hands on January 1, 1914; and the price per bushel on December 1 and March 1. The area and production of wheat for 1911–1913 are shown for all countries for which data are available.

[Agricultural statistics of the British Empire and foreign countries], R. H. REW (*Bd. Agr. and Fisheries [London], Agr. Statis., 47 (1912), No. 5, pp. 369–515*).—This report contains data showing the area under crops and amounts produced for 1910, 1911, and 1912, the number of live stock for the latest year available with comparative data for earlier years, and prices of agricultural produce for a series of years. The countries included consist of the United Kingdom, the principal British colonies, and practically all the foreign countries that have data regarding crops and live stock.

Return of prices of crops, live stock, and other Irish agricultural products, T. BUTLER (*Dept. Agr. and Tech. Instr. Ireland, Agr. Statis. 1912, pp. 81, fig. 1*).—This annual statement contains prices of the principal farm crops, live stock, beef, mutton, pork, butter, eggs, and wool. The weekly prices are shown for 1912 and the annual prices for 1903–1912. Diagrams are appended showing fluctuations in the more important items.

Agricultural statistics of Saxony, WURZBURGER (*Statis. Jahrb. Königr. Sachsen. 41 (1913), pp. 112–136, 161–170*).—This is the annual statement showing areas devoted to the principal field crops, the total yield and yield per hectare, the uses of cultivated land, the total number of live stock and the number slaughtered, and the prices of the principal agricultural products.

The commerce of France with Russia (*Bul. Mens. Off. Renseig. Agr. [Paris], 12 (1913), Nos. 7, pp. 841–862; 9, pp. 1095–1110; 10, pp. 1215–1227; 11, pp. 1344–1358*).—In these articles is outlined the trade of France with Russia in the principal agricultural products, live animals, and animal products by showing for 1911 the total amount exported and the destination. The text is supplemented with statistical tables showing for practically all the items mentioned details for 1911, and for the more important items details for earlier years.

AGRICULTURAL EDUCATION.

Organization of agricultural education and extension, A. F. WOODS (*Coop. Manager and Farmer, 3 (1914), No. 6, pp. 53–56*).—The author reviews present facilities for agricultural education in this country and calls attention briefly to some of the dangers threatening educational work. In summarizing he says "we are entering a new economic stage of development in which waste must give way to conservation, ignorance to knowledge, rule of thumb to scientific method, selfishness to cooperation in its best sense of division of labor."

Agricultural education in secondary schools, A. W. NOLAN (*School News and Pract. Ed., 26 (1913), No. 11, pp. 484–486*).—A plan is given for the organization of country life clubs, subordinated to the Collegiate Country Life Club of America (E. S. R., 29, p. 199), for the development of the industrial, commercial, and social side of farming and to be carried out as a part of secondary agricultural courses.

The high school agriculture clubs, P. I. DOUGHERTY (*Univ. Cal. Jour. Agr., 1 (1914), No. 6, pp. 8–11*).—Twenty high school clubs of agriculture have been organized in California by the students of the college of agriculture for the purpose of improving social and economic conditions in the country. A copy of the constitution adopted is given, together with an outline for a potato growing contest for club members only and reference to work done by these clubs.

Club work in Ohio, L. S. IVINS (*Rural Educator, 3 (1914), No. 3, pp. 57, 49*).—An account is given of the cause of the rapid development, organization, and

value of club work in Ohio which now includes activities in corn and wheat growing, domestic science, and potato, apple, tobacco, vegetable, back yard garden, melon, and better lawn contests.

Industrial education in Oregon. ALICE L. WEBB (*Rural Educator, 3 (1914), No. 3, pp. 44, 45*).—This is an account of industrial education in the public schools of Oregon, in which 2 field men gave their entire time to visiting the schools of every county, thus giving instruction to 11,105 children on the preparation of exhibits for school and state fairs. Three faculty members of the college of agriculture reached 7,035 additional children. The college distributed 4 extension bulletins to aid in this work and also offered lectures and demonstrations on different phases of agriculture and home economics in 25 high schools on 25 different occasions. Last year 88 children's fairs were held throughout the State with a total prize list of $20,000 and 75,000 exhibitors. The recent legislature appropriated $6,000 for this field work.

Mutual forest societies of elementary school children. G. ADAM (*Vie Agr. et Rurale, 3 (1914), No. 11, pp. 283–285, figs. 3*).—The author describes the objects, work, and results of mutual forest societies of elementary school children in the Department of the Vosges, France. The aim is to give children practical and theoretical instruction in silviculture and grafting, to teach them to love the trees and respect birds' nests, to know the beneficial and injurious insects of the forests, etc. The movement was begun 10 years ago and in 1912–13 there were 39 societies with 1,652 members. The number of societies has subsequently increased to 49.

Will school-gardening survive? H. M. BENEDICT (*Nature-Study Rev., 9 (1913), No. 8, pp. 257–262*).—In this discussion the author maintains that the success of the garden depends on the ensurance of the crop, and that, therefore, "three fundamental necessities must be met by a successful system for the development of the home garden movement in cities, viz, obtaining garden experts; bringing these experts into contact with the children in their homes; welding them into a permanent coherent effective organization for the continuous increase of home gardens, a definite factor added to the life of the city for the years to come." Such a system has been originated in Cincinnati where both community and home gardens are being developed with much the larger emphasis upon the home garden. This system which is described is essentially a cooperative arrangement between the department of botany of the University of Cincinnati and the public school authorities, the latter paying additional salary to those teachers desiring to become official garden inspectors after school hours and during the summer, while the university offers special garden courses to train such teachers for their work.

Credit for home work in agriculture (*Rural Educator, 3 (1914), No. 3, p. 41*).—A list of projects that may be performed at home by rural school pupils in Sauk County, Wisconsin, is given, together with rating awarded when satisfactorily completed.

Developing home economics work in Missouri, BAB BELL (*Missouri Bd. Agr. Mo. Bul., 11 (1913), No. 11, pp. 23, figs. 5*).—This bulletin discusses home economics with a view to awakening interest, and sets forth a more definite plan of work which is to be conducted under the auspices of the state board of agriculture. A copy of a circular, prepared in part by the author, is included for a boys' and girls' corn and home economics contest, containing score cards for the different classes of work as well as other data.

Agricultural home economics instruction in foreign countries, P. SCHINDLER (*Ann. Sci. Agron., 4. scr., 2 (1913), II, No. 6, pp. 727–742*).—The author dis-

cusses the economic, practical, and moral rôle of the agricultural home economics school and calls atention to three principal types of agricultural home economics instruction, viz, the analytical course or school in individual subjects, such as cooking, sewing, etc., instruction preparing for the home, and professional instruction as found in the national systems of education of England, Belgium, Sweden, Norway, Switzerland, and Hungary, which are described.

Woman's place in agriculture (*3. Cong. Internat. Cercles Fermières Gand. 1913, Compt. Rend., pp. [133]*).—This is a report of the proceedings of the Third International Congress of Farm Women's Clubs held at Ghent June 12 to 15, 1913.

The professional place of the farm woman (*3. Cong. Internat. Cercles Fermières Gand, 1913, Raps. Sect. 2, pp. [112]*).—This section's report consists of discussions on farm women's work in dairying, poultry raising, kitchen gardening, keeping accounts, and flower and shrubbery ornamentation.

Associations of farm women (*3. Cong. Internat. Cercles Fermières Gand., 1913, Raps. Sect. 1, pp. [183]*).—This report contains accounts of the organization, work, and results of farm women's associations in Belgium, Poland, Ireland, the United States, France, Province of Hainaut (Belgium), Kizkimfelegyhaza (Hungary), and the Province of Ontario, Canada, also some ideas relative to rural desertion, some social laws interesting to agriculture, the itinerant home economics course, and the report of the Women's Agricultural and Horticultural International Union.

The farm woman, the mother of the family, and the housekeeper (*3. Cong. Internat. Cercles Fermières Gand., 1913, Raps. Sect. 3, pp. [195]*).—The papers presented relate to the farm woman's role in home education, child hygiene, clothing, village esthetics, furnishing and decorating the home, food of the lower class, utilization and conservation of vegetables and fruits, looking after the professional education of children and keeping them on the farm, and organizing rural recreation.

Farmers' clubs, their organization and work (*North Carolina Sta. Circ. 15 (1914), pp. 11*).—Information is given on how to start a farmers' club, where to obtain material for discussion, and the importance of organization, followed by a tepical and seasonal arrangement of subjects, with references.

MISCELLANEOUS.

Annual Report of Nevada Station, 1913 (*Nevada Sta. Rpt. 1913, pp. 61*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1913, a report of the director, departmental reports, the experimental work of which is for the most part abstracted elsewhere in this issue, and a list of available publications.

Thirty-second Annual Report of Ohio Station, 1913 (*Ohio Sta. Bul. 263 (1913), pp. XXX, fig. 1*).—This contains the organization list, a report of the board of control, a financial statement for the fiscal year ended June 30, 1913, and a report of the director summarizing the work and publications of the station during the year.

Press Bulletins (*Ohio Sta. Bul. 263 (1913), pp. 543–546*).—Reprints of press bulletins on the following subjects: Grasshoppers; the county experiment farm—how it will be managed and what it is expected to accomplish; seed treatment to prevent oat smut; and warbles or bots in cattle.

NOTES.

Arizona University.—An agricultural extension service has been established with S. F. Morse, who has been acting professor of agriculture and agriculturist during the past year, as superintendent. It is planned to carry on this work largely through traveling field agents and lecturers. Some special lines to be developed are the collection of data as to the business side of Arizona farming, demonstrations, personal advice, the formation of local and state organizations of farmers, and the maintenance at headquarters of an exchange bureau or clearing house of agricultural information, especially as regards sources of live stock, seeds and other farm products, farm help, etc.

California University and Station.—At the recent commencement, the degree of LL. D. was conferred upon Dr. E. W. Hilgard, from 1874 to 1906 professor of agriculture and dean of the College of Agriculture. E. H. Hagemann, instructor in dairying and assistant in dairy industries, has resigned.

Iowa College.—At the recent commencement, the degree of D. Sc. was conferred upon Hon. James Wilson, ex-Secretary of Agriculture. The graduating class in agriculture numbered 114, of whom it is stated about four-fifths are planning to take up farming immediately.

A mock auction sale of college live stock was recently held, about 500 students participating. The students had charge of the assembly and advertising of the stock and prizes were awarded for the best work in exhibiting, bidding, etc. The mock auction aroused great interest and it is announced that it will be made an annual event.

A. E. Potts, assistant in cheese making in Cornell University, has been appointed instructor in dairying.

Maryland College.—The dedication of Calvert Hall, the new dormitory, took place May 30, the principal address being given by Hon. W. P. Borland of Missouri. The day was observed as Farmers' Day, opportunity being afforded for an inspection of the lines of work at the college and station, including demonstrations of hog cholera serum and the summer meeting of the State Horticultural Society.

The college has arranged to inaugurate a department for the training of teachers in agricultural and vocational subjects for the rural schools. A 4-year course of regular college grade will be offered, and a summer school for rural teachers including instruction in agriculture, home economics, and the sciences generally was held during July. It is expected to organize a model high school in connection with the department in which will be incorporated the work now assigned to the preparatory and subfreshman classes. It will also be used for practice teaching.

Michigan College.—An important decision by the State Supreme Court was announced May 29, declaring unconstitutional the recent appropriation act in which the legislature had included a provision that "no part of this or any other appropriation shall be available in case a sum in excess of $35.000 from any or all sources shall be expended in any one fiscal year for the maintenance

of the mechanical and engineering department." This provision was held unconstitutional on the ground that the state constitution "has given to the relator the general supervision of the college and the direction and control of all agricultural college funds. So long as the relator employs them for the purposes intended by the grant, it is beyond the power of the legislature to control the relator's use of the funds received from the Federal Government and long ago appropriated to the agricultural college. Undoubtedly the grant of funds was to the State and the disposition of them wholly within the power of the State, acting through its legislature, in accordance with the conditions of the trust imposed. . . . I am called upon to neither affirm nor deny the proposition that the legislature may now appropriate the federal fund, in whole or in part, to some other institution, withdrawing it, or some of it, from the agricultural college, so long as it keeps faith with the Congress. The legislature has not withdrawn it from the college nor appropriated it, or any part of it, to another institution. It remains an agricultural college fund, within the meaning of the constitution, devoted, under the supervision and direction of the relator, to the college and to the purposes expressed in the grant, in state legislation, and, finally, in the constitution of the State. It is required to be annually applied to the specific objects of the original gift, grant or appropriation. Necessarily, it must be so applied, under existing conditions, by the constitutional supervisors of the fund, and of the college, and not by the legislature. It follows that the legislature exceeded its powers in attempting to deprive the relator of its constitutional control of agricultural college funds derived from the Federal Government."

The effect of this decision is to restrict the appropriations for the current year to the same basis as for the previous appropriation act, thus making a reduction in the college tax levy from ⅛ mill to $\frac{1}{15}$ mill, and considerably handicapping development for the present.

Nebraska University and Station.—Dr. R. A. Emerson has resigned as professor of horticulture and horticulturist, beginning September 1, to accept a position as professor and head of the department of plant breeding in Cornell University.

Nevada University.—President J. E. Stubbs died very suddenly May 7. Dr. Stubbs was born in Ashland, Ohio, March 19, 1850, and educated in the Ohio Wesleyan University, Drew Theological Seminary, and the University of Berlin. He had been successively superintendent of schools in Ashland, president of Baldwin University at Berea, Ohio, and since 1894 president of the university, and until 1912 director of the station. During this long period of development he had contributed greatly to the upbuilding of the institution. He was also a well-known figure in the Association of American Agricultural Colleges and Experiment Stations, serving as its president in 1899–1900, and on various committees.

Rhode Island Station.—L. P. Howard, a 1914 graduate of the Massachusetts College, has been appointed assistant in chemistry and has entered upon his duties.

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V

EXPERIMENT STATION RECORD.

Editor: E. W. ALLEN, Ph. D., *Assistant Director.*
Assistant Editor: H. L. KNIGHT.

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EXPERIMENT STATION RECORD.

VOL. XXXI. AUGUST, 1914. NO. 2.

The place of the publication in the activities of the agricultural colleges and experiment stations is increasing in importance and prominence year by year. It is an expression of the broadening field of publicity work at these institutions, and likewise of the growth of their reading constituencies. It is a recognition of the fact that the colleges and stations are working for all the people, and not merely for the few who come in direct contact with them.

Very naturally this development has led to greater attention to the making of these publications, in order that they may effectively carry the message, and to systematic provision for this service. What was at one time an incidental feature has become a prominent and important one, and this has developed a special class of workers. It is at once a division of labor and an interesting recognition of the need for the handling of publications by experts with training and insight such as to make them capable of this special form of work.

So recently as 1911 at only three experiment stations—Iowa, New York State, and Wisconsin—had officers designated as editors been appointed, and one of these was also serving as librarian. By July, 1913, however, the number had so increased that a meeting of the agricultural editors and publicity men of the mid-western colleges was held at the University of Illinois, and this gathering developed a belief in the desirability of an organization of national scope. As a result of this, a conference was held at the Kentucky Experiment Station June 25 and 26, 1914, which brought together representatives of thirteen States, as well as this Department, and found institutions in numerous other States eligible for membership. An interesting program, dealing with various phases of the details of bulletin editing and distribution, as well as of agricultural college and experiment station publicity work, was presented as discussed in detail on page 199 of this issue, and a formal organization was effected, to be known as the American Association of Agricultural College Editors, with provision for committee activities and annual meetings. Much interest and enthusiasm were displayed by those in attendance, and it seems probable that the next meeting, which is

expected to convene at the University of Wisconsin in June, 1915, will find the new association established on a permanent basis.

The mere addition of another to the steadily lengthening list of associations, societies, and similar groups of workers in the various fields of agriculture is nowadays much too common to excite more than momentary general interest, and perhaps a doubt as to whether the process of organization is not being carried close to the limits of expediency. Such a query is particularly likely to suggest itself in the case of a body of workers some of whose duties are of a semi-administrative and delegated nature, and many of whose problems are in the first instance the problems of administrative officers, and as such have received through existing organizations considerable attention from time to time.

The desirability of an additional association was therefore a matter which early received the attention of the Lexington conference, and the decision that the step was warranted was reached after its consideration from several points of view. Thus, it was felt that while the formulating of general policies pertaining to publications was unquestionably a problem for administrative heads, there still remained many details as to the ways and means of working out these policies, in which the exchange of ideas and the combined judgment of those directly in charge could be of much usefulness. For instance, one of the papers on the program was a discussion of the processes used in bulletin illustration. This is a topic obviously of too specialized a nature to justify its inclusion in the congested program of such organizations as the Association of American Agricultural Colleges and Experiment Stations or the Society for the Promotion of Agricultural Science, although it is a subject concerning which much less is understood by many of those immediately concerned than its importance warrants.

In the case of topics of more general interest it was thought that joint programs might occasionally be arranged with other organizations. As a means to this end the new association included among its standing committees one on cooperation with other agencies. Such a committee would be available to participate, if desired, in functions similar to those contemplated by a committee appointed by the Agricultural Libraries Section of the American Library Association at its last meeting, which is to submit suggestions relative to the improvement of station publications from the bibliographical standpoint to the Association of American Agricultural Colleges and Experiment Stations. It is quite evident that from a joint consideration of such a topic from the administrative, editorial, and bibliographical points of view, most helpful suggestions could be expected.

The maintenance of an organization of agricultural college editors, and this term it should be stated was so defined as to include those engaged in similar work in the experiment stations and this Department, should also be of value in establishing ideals and standards in this comparatively new occupation. The special requirements which have led individual institutions to provide for an editorial corps have been quite varied, and in consequence prominence has sometimes been given to duties somewhat analogous to those of a press agent, in others approximating those of a proofreader or printing clerk, and in others embracing work of a grade demanding not only technical knowledge and editorial ability but a substantial scientific education.

It is quite probable, and perhaps not wholly undesirable, that this diversity will continue for a considerable period. The work undoubtedly represents different grades of requirement, but it affords opportunity for the exercise of a high grade of technical and scientific understanding. Indeed, some of the difficulties encountered have been due to a lack of this, which has prevented the development of sympathetic, cooperative relations between the author or scientific worker and the editor. Such relations are much to be desired, and are worthy of attention to bring about mutual understanding. Experience has shown the difficulty of attracting to such editorial service men whose equipment and training have qualified them to make it a life work. This is partly due to an underrating of the status of such men and a failure to make the positions sufficiently attractive. Men will have to be developed who combine taste for such work with the necessary knowledge, and we shall have such men in greater abundance when high standards tend to elevate their positions and give them due recognition. An association devoted to the interests of the otherwise isolated individuals in this field will not only serve to call attention to this growing branch of activity, but also give standing and recognition to it. Likewise, if these agricultural editors through their conferences and their concerted influence bring about a higher standard of excellence in the publications they will not only dignify their own work but that of the class of publications they represent.

The fundamental object of the new association should be the improvement of the publications of the institutions represented. In the words of Dr. Kastle, of the Kentucky Experiment Station, in an address of welcome to the delegates, it should be the mission "more than anything else to give some tone and dignity and solid and enduring worth to all of our communications." This of course, as already suggested, is a problem which will demand the best thought of the director, the investigator, the extension worker, and the libra-

rian, as well as the editor, but in many of its details it constitutes the latter's special problem and one still far from solution.

Great improvement, to be sure, has already been effected over the earlier days. In attractiveness of appearance and attention to mechanical details the change is both notable and commendable, and there has also been great gain in the direction of adapting the publications more closely to the needs of those whom they are intended to reach. The average station bulletin now has a popular summary or it may be a popular edition, and the publications of most institutions are classified according to their technical or popular character. The old charge of "shooting over the farmer's head" is much less justified than ever before, and in fact the danger in some cases is that of underestimating the farmer's real stature and understanding.

One result of the earnest desire upon all sides to make the publications genuinely useful has been not only to popularize the style of the regular station bulletin, but also to multiply widely the channels of communication, especially by means of the extension service. A vast increase has thus been seen in the number of circulars of information, leaflets, etc. The agricultural press has been utilized as never before, and within recent years the newspapers, both those circulating in country districts and those for city readers, have been furnished in increasing abundance with press bulletins, notices, and in many States with plate matter itself, dealing with farm life in nearly every phase.

Much of this effort has been very useful, particularly in bringing before the public in an intimate way the work of the colleges and stations at a time when their purposes and value were too little understood and appreciated. Ten years ago these institutions as a class needed legitimate advertising, and there is still every reason why they should keep in close touch with their constituents. There are, however, tendencies in some of the modern methods of disseminating information, broadcast as it were, which may well be looked upon with some apprehension. Our publication work has often been too much of the "touch and go" character, with no "follow up." New ideas have to be pressed home persistently, and should not be left to propagate themselves.

On the other hand, it was ably pointed out by Dr. Kastle that "as agricultural institutions we are literally deluging the world in printer's ink, and in the matter of our publications there is a vast amount of unnecessary duplication of work and frequently an unnecessary exploitation of the individual rather than the cause." Hence this activity calls for intelligent control and direction; and unless it is in the hands of men of good judgment and the proper point of view successful control is very difficult. Some of these tendencies of course, as Dr. Kastle explained, are by no means confined

to workers in agricultural science, yet it is most desirable that the present general good will toward agriculture should be retained, and it is well to reflect upon the possibility of a reaction in case public sentiment should for any reason ever become surfeited.

The fact is that the whole subject of extension publications is comparatively new. It seems probable that we are still in a transition stage, with much yet to be learned as to the best forms and methods in this sort of instruction. Just at present, therefore, an interchange of views and experiences, such as constituted a prominent portion of the Lexington program, would seem to be a most useful preliminary in the sifting of the wheat from the chaff.

One of the most important considerations, although not always appreciated in the preparation even of station bulletins and similar publications, is their permanent value as works of reference. Seldom can information by the printed page be so timed as to reach the farmer precisely when desired, but this is less essential if the information is in such form as will lead him to preserve it for the day of need. He should therefore be encouraged to build up his own library, and an important step in this direction is sending him publications which it is worth his while to preserve. Such publications, even when of an extension nature, will be readily differentiated from much of the material prepared for newspapers and magazines and intended chiefly to arouse interest or stimulate further inquiry, as their primary purpose will be not to entertain but to inform. A spectacular method of presentation will thus be of much less importance than substantial subject matter, plainly stated and so arranged as to be found readily by a busy man when desired.

It is well to make even this class of publications attractive, but better than a multitude of illustrations or the embellishments of the most approved newspaper or magazine style may be the use of a durable grade of paper or the supplying of an adequate index or table of contents. The abolition of unnumbered publications—the bane of every librarian, professional or otherwise—and the reduction of publications to as few series as possible will also favor the preservation of this material. These benefits, moreover, will not be confined to individual farmers, but will also be most helpful to libraries, schools, etc. Of late a great demand for agricultural information is being made on public libraries in both country and city as a result of the prevailing interest of all classes of people in rural life; but too often the libraries are so handicapped by the apparently limited regard of the authors for bibliographical considerations as to make them hesitate to undertake the complicated task of obtaining order from the chaotic mass which is descending upon them.

If the conception of the college or station publication as a contribution to a permanent record could become more general, the volume of such literature might be appreciably reduced but the standards of quality would be speedily elevated. The scientist would be less likely to publish prematurely and more likely to look upon the publication as the culminating stage of his research. Likewise, the editor, the director, and the librarian, as well as the general public, would see in the material not only its immediate news value but its larger significance to the future as well as to the present as a work of reference.

No one will question the chance for improvement in our publication work or the desirability of having it receive thoughtful attention and suggestion from men whose work tends to make them experts. The American Association of Agricultural College Editors, consisting of those primarily engaged in the preparation of these publications, would seem to possess a special opportunity for service along such lines, particularly if it can secure the cooperation of other organizations. Its formation at this time may, therefore, be regarded as of considerable importance, and its efforts to accomplish the purposes for which it has been established will be awaited with much interest and expectancy.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Flavor of Roquefort cheese, J. N. CURRIE (*U. S. Dept. Agr., Jour. Agr. Research, 2 (1914), No. 1, pp. 1–14*).—The purpose of this investigation was to identify and explain the occurrence of any substances which are responsible for the peculiar peppery or hot taste present in well-ripened Roquefort cheese.

The neutral flavor solution of Suzuki et al. (E. S. R., 24, p. 382) from 750 gm. of Roquefort cheese showed a total amount of acidity in ester combination corresponding to 0.44 decinormal cc. The proportional numbers obtained by the Duclaux distillation approximated the constants for acetic acid. The odor of Roquefort cheese suggests that part of its flavor may be due to the presence of ethyl acetate, but the quantity present makes it doubtful whether it would materially affect the test. It was noted that the amount of volatile insoluble fatty acids of milk fat increased with the ripening of the cheese, and these when found floating on the surface of the distillate had a peppery taste.

From five fractions, the barium salts of caproic, caprylic, capric, butyric, and acetic acids were obtained. The chief constituent of the insoluble acids was capric acid. The quantitative estimations made it evident that a small amount of formic acid is present also. The peppery taste of Roquefort cheese is ascribed to the presence of caproic, caprylic, and capric acids and their easily hydrolyzable salts which originate from a hydrolysis of the fat of milk. Evidently in the normal ripening of Roquefort cheese very few of the acids originate from the putrefaction of proteins. The small quantity of acetic and formic acids present can result from a fermentation of carbohydrates in the early stages of ripening or they may be the products of a partial oxidation of higher acids or glycerol by mold.

Studies are also reported on the action of *Penicillium roqueforti* on butter fat. Czapek's solution, in which cane sugar was replaced by 3 gm. of fresh, filtered milk fat, was employed as the nutrient medium. The results when compared with the controls showed a hydrolysis of about two-thirds of the fat. When the mold was grown on fresh curd "the fat showed decided decomposition, but there was only a meager accumulation of soluble and volatile acids. A culture at the age of 45 days contained only 0.75 decinormal cc. of soluble acids in 500 cc. of distillate. A culture similarly grown but in the presence of *Bacillus lactis acidi* contained only 0.8 decinormal cc. of soluble acids in a like volume of distillate. The acid number of the fat in both cultures showed that more than one-half of it had been hydrolyzed. . . . The enzymotic studies show that *P. roqueforti* is well supplied with an enzym capable of hydrolyzing both simple esters and triglycerids."

A bibliography of literature cited is appended.

On the influence of preliminary heating upon peptic and tryptic proteolysis, A. H. BIZARRO (*Jour. Physiol., 46 (1913), No. 3, pp. 267–284, figs. 6*).—"Sörensen's formaldehyde method was applied to the study of the influence of

heating upon the peptic and tryptic digestion in vitro of white of egg, gelatin, fibrin, beef, and casein. The number of cubic centimeters of sodium hydrate required to neutralize the digestion mixture increases clearly after the thirteenth day of peptic digestion of ovalbumin and gelatin; also in the eighth day of beef; and after the second day digestion of casein and fibrin.

"The above results, as could be foreseen, gave no clear conclusions about the digestive activity of pepsin, but they decisively bear out the view of the slow liberation of amino-acids groupings by this enzym. Preliminary heating of egg white at 120 to 140° C. makes trypsin proteolysis more active. Preliminary heating increases the tryptic digestion of fibrin, casein, and beef, and decreases that of gelatin. The amino-acids groupings in tryptic solutions increase after 15 hours' digestion."

The kinetics of invertase action, L. Michaels and Miss M. L. Menten (*Biochem. Ztschr., 49 (1913), No. 5, pp. 333–369, figs. 19*).—Saccharose apparently combines with invertase to form a compound with a dissociation constant of 0.0167. The combination is labile according to the equation 1 molecule saccharose-invertase compound → 1 molecule fructose + 1 molecule glucose + 1 molecule invertase. Invertase also has an affinity for fructose, glucose, the higher alcohols (mannit, glycerol), and other carbohydrates, but not for lactose. The affinity, however, is smaller than for saccharose and the compound is not labile.

The concentration of all the compounds can be calculated from the law of mass action, and fairly accurate dissociation constants can therefore be easily supplied for each. The most exact dissociation constant is for the saccharose-invertase compound. As the decomposition of the saccharose-invertase compound must be a monomolecular reaction, the rate of decomposition of the saccharose is proportional to the concentration of the saccharose-invertase compound.

The localization of betain in plants, V. Staněk (*Ztschr. Zuckerindus. Böhmen, 37 (1913), No. 8, pp. 385–390; abs. in Chem. Ztg., 37 (1913), No. 65, Repert., p. 296*).—The data show that betain is very unevenly distributed in plants, but is chiefly present in young leaves and shoots which are still green. Probably this substance plays a part in the nitrogen economy of the plant. Seeds do not contain betain as a reserve material.

Studies in the chemistry and physiology of the leaves of the betel vine (Piper betle), and of the commercial bleaching of betel-vine leaves, H. H. Mann, D. L. Sahasrabuddhe, and V. G. Patwardhan (*Mem. Dept. Agr. India, Chem. Ser., 3 (1913), No. 2, pp. 17–63*).—An investigation of certain aspects of the chemistry and physiology of this plant, which is reported under the following heads: "(1) The occurrence of nitrates in betel-vine leaves and plants, and their relationship to the growth of their vine; (2) the sugars, starch, tannin, essential oil, and other normal constituents of the betel vine and their relationship to the growth of the vine; (3) the commercial bleaching of the betel-vine leaf, and the chemical changes by which it is accompanied."

Chemical studies on the lime-sulphur-lead arsenate spray mixture, W. E. Ruth (*Jour. Indus. and Engin. Chem., 5 (1913), No. 10, pp. 847–850*).—Previously noted from another source (E. S. R., 29, p. 802).

The titrimetric determination of ammonia, L. W. Winkler (*Ztschr. Angew. Chem., 26 (1913), No. 31, Aufsatzteil, pp. 231, 232; abs. in Chem. Ztg., 37 (1913), No. 65, Repert., p. 293*).—Instead of either hydrochloric acid or sulphuric acid solutions, boric acid (3 gm. of crystallized boric acid in 100 cc. of water) in excess can be employed to collect the ammonia on distillation. As boric acid reacts neutrally toward Congo red and methyl orange, the excess of boric acid present can be titrated with standard hydrochloric acid solution.

A rapid method for the determination of ammoniacal nitrogen with formaldehyde, GAILLOT (*Ann. Chim. Analyt., 18 (1913), No. 1, pp. 15–17*).—For sulphate of ammonia the procedure is as follows:

Five gm. of the ammonium salt under examination is dissolved in water and then made up to a bulk of 100 cc.; 20 cc. of the filtered solution, to which a few drops of formaldehyde has been added, is neutralized with potassium hydroxid as ammonium sulphate is always a little acid; about 5 cc. of neutral 40 per cent formaldehyde solution is added, the acid liberated titrated with normal potassium hydroxid, and the number of cubic centimeters of alkali used multiplied by 1,500. The resulting figure shows the amount of ammoniacal nitrogen in 100 gm. of sulphate of ammonia. The free ammonia in such substances is determined by direct titration and can be found in the same solution.

For simplifying the calculations the author proposes employing a solution of potassium hydroxid of which each cubic centimeter corresponds to 0.035 gm. of sulphuric acid. Each cubic centimeter of the potassium hydroxid solution made in this manner will correspond to 0.01 gm. of ammoniacal nitrogen.

The method gives the same figures which are yielded by the classical method for determining ammoniacal nitrogen.

A rapid method for determining formaldehyde, GAILLOT (*Ann. Chim. Analyt., 18 (1913), No. 1, pp. 17, 18*).—The principle of this method is the same as that underlying the method described above, namely, if ammonia in combination with an acid is brought into contact with formaldehyde, an insoluble compound, hexamethylene tetramin, is formed ($6HCOH+4NH_3=(CH_2)_6N_4+6H_2O$), and the acid radical of the ammonium salt is liberated. This acid can be titrated with an alkali, using phenolphthalein as the indicator, and referred to the factor for calculating formaldehyde.

Comparison of methods for the determination of dissolved oxygen, J. W. SALE and W. W. SKINNER (*Abs. in Science, n. ser., 38 (1913), No. 985, p. 716*).—This is a comparative study of the Winkler and modified Levy methods with the gasometric method for oxygen. With pure and moderately diluted saline waters the Winkler method gave accurate results, and the Levy method results which were low. "The Winkler method also gives closely agreeing results in duplicate and triplicate determinations on such waters, for the most part within 0.02 cc. oxygen per liter. Only that modification of the Levy method in which sodium carbonate is used to precipitate the iron salts was compared."

New precipitants for copper, P. A. KOBER (*Abs. in Science, n. ser., 38 (1913), No. 985, p. 712*).—"Two new precipitants for copper are proposed which form very insoluble compounds of copper (less than 0.6 part in 1,000,000 remains unprecipitated). These are amino acids, phenylglycin and normal amino caproic acid, which may be useful in estimating Fehling's and other solutions for unreduced copper and in removing copper quantitatively from substances which interfere with its iodometric titration."

The determination of sulphur in certain culture media, H. W. REDFIELD and C. HUCKLE (*Abs. in Science, n. ser., 38 (1913), No. 985, pp. 715, 716*).—A study was made of the amount of total sulphur broken down in simple peptone media by the so-called "putrefactive bacteria," "of the forms of sulphur most readily used by them, and of the forms in which the sulphur exists after the action of the bacteria, whether as fixed sulphur or as loosely bound sulphur, or as easily oxidized sulphur, or as a volatile sulphur compound such as hydrogen sulphid, when culture flasks of different size and shape were used and when air or carbon dioxid was passed over the cultures."

A comparative study of methods for determining sulphur in peptone, H. W. REDFIELD and C. HUCKLE (*Abs. in Science, n. ser., 38 (1913), No. 985,*

p. 715).—The best results were obtained with the Liebig-Koch method for peptone. For the determination of the easily oxidizable part of the sulphur, digestion with a saturated solution of chlorate of potash in nitric acid proved the most valuable.

The determination of sulphur and chlorin in the rice plant, ALICE R. THOMPSON (*Jour. Amer. Chem. Soc., 35 (1913), No. 10, pp. 1628–1634*).—Previously noted from another source (E. S. R., 29, p. 231).

The determination of humus in heavy clay soils, W. BEAM (*Cairo Sci. Jour., 7 (1913), No. 85, pp. 219–224*).—In continuation of work previously reported (E. S. R., 28, p. 19), certain soils were encountered which were difficult to treat even by the method of washing with carbon dioxid. In looking for the cause of this, it was found that the acid employed for the extraction of the magnesium and calcium had a marked effect upon the rapidity of the subsequent filtration when the washing was done by water or carbonated water.

With an increase in the strength of the acid, the difficulties in washing increased. "The use on the other hand of a weaker acid than that of 1 per cent, commonly employed, results in a marked advantage in this respect; but it was not found practicable, as a rule, to carry the dilution below 0.5 per cent . . . since the extraction of the calcium and magnesium may be incomplete, the proportion of humus found being, in such cases, below the truth. A still further improvement was effected by substituting for the solution of carbonic acid a very dilute solution of hydrochloric acid—about 0.02 per cent." The use of such dilute hydrochloric acid for the washing makes the method applicable to all classes of soils with ease and certainty.

Working with soils from the Nile no marked differences were noted in the results when ammonia up to a strength of 16 per cent was used (E. S. R., 24, p. 9), providing the soils were in a properly flocculated condition. When this is not the case, a stronger ammonia may lead to higher results; the proper humus figures can only be obtained after repeated extraction with ammonia. The author prefers 4 per cent ammonia. Although the filtrate obtained is quite clear in the method recommended by the author, it is deemed advisable to add 0.5 gm. of ammonium carbonate as suggested by Rather (E. S. R., 25, p. 614) to each 100 cc. of the ammoniacal solution. If ammonium carbonate is employed in too large amounts, the figures will be far below the truth. "It is interesting to note that if in the modified official method the washing out of the acid is effected by the use of 0.02 per cent hydrochloric acid, practically the whole of the chlorid in the ammoniacal extract is carried down with the clay when the solution is treated with ammonium carbonate."

The humus in the soils of the Sudan can be very accurately estimated by the colorimetric method. "In the case of soils of approximately the same composition as regards proportion of clay and humus the latter may be determined by direct boiling with 0.5 per cent sodium carbonate solution, preferably after previous boiling with distilled water in order to disintegrate the soil. Five gm. of the latter is treated with 400 cc. of distilled water in an enameled iron vessel and boiled for five minutes; 20 cc. of a hot solution containing 2.5 gm. of sodium carbonate is then added and the boiling continued for exactly one minute. The liquid is cooled as rapidly as possible, made up to 500 cc., and allowed to stand over night in a covered beaker. If not perfectly clear the supernatant liquid is filtered through an asbestos filter. A small Buchner funnel is suitable. The comparison is made with a similar soil of known humus content treated in the same way.

"The most accurate results are obtained by treating the soil with acid, as in the gravimetric determination, followed by extraction with ammonia. The

removal of the excess of hydrochloric acid is of course not necessary. Using this method the comparison may be made between soils of greatly varying composition both as regards clay and humus."

The influence of ammonium carbonate upon the determination of humus.—A rapid and efficient filtration procedure, W. H. MacIntire and J. I. Hardy (*Tennessee Sta. Bul. 103 (1914), pp. 47–76, figs. 2*).—In this work the authors have modified the Rather method (E. S. R., 25, p. 614) by reducing the ammonium carbonate required to 1 gm. and filtering the entire mixture immediately after adding the carbonate and after the 36-hour period in which the soil was in contact with ammonia. The Buchner funnel and suction were used in the operation. By the use of this apparatus, etc., the time of filtration of the humus extract is shortened. While the introduction of the ammonium carbonate accelerates filtration, extra care must be exercised to shake the mixture gently after the addition of the carbonate, otherwise filtration is retarded.

As a filtering medium the soil itself is preferred. Although sand when added to the soil at the time of filtration increases the speed of filtration, the results obtained with it are not uniform. The modification recommended reduces the amount of ash obtained. The results obtained with the modification are more in accord with those yielded by the Smith and Mooers-Hampton methods than by the Rather method. No sediments were found in the humus solution after standing for six months. If the soil is allowed to stand in contact with the ammoniacal solution containing carbonate a change in the humus content of the solution takes place.

"Because of the two distinctly opposite influences of ammonium carbonate, and occlusion effected, the period of contact of soil with carbonate is an important factor, and in the modification is reduced to the minimum. The decrease in humus resulting from the addition of carbonate can not be attributed to lessening of alkalinity. There is no chemical precipitation from the humus solution effected by the addition of ammonium carbonate. There is no fixation of carbonate, chemical or mechanical, in the solution free from contact with the soil. The physical effects (occlusion) of 25-gm. charges of normal carbonate and acid carbonate of ammonia and mixtures of the two salts are greater than their solvent action in both water and ammonia solutions, the reverse being the case with the smaller treatments. Twelve-hour contact with 4 per cent ammonia converted all acid carbonate in the three amounts used to normal carbonate, but 2-hour contact does not convert all of the bicarbonate in 2½- and 25-gm. charges of the salt.

"Pure clay may be easily filtered immediately by the modified procedure. . . .

"A solution of the black meadow soil was not freed from excess of iron by the later modification suggested by Rather. Ammonium sulphid removed both iron and organic matter from ammonia solution. Carbon bisulphid eliminated iron without any apparent effect on the organic matter of the ammonia solution. In such unusual cases where the ash is shown to be due to $Fe_2(OH)_6$ instead of to clay the application of a correction of 33 per cent is suggested. . . .

"Repeated digestions and filtrations by the 1-gm. modification upon the same soils have given solutions practically identical in analysis. It is emphasized that the original official method directs the use of 4 per cent NH_3 instead of 4 per cent NH_4OH, as is erroneously given in Bulletin 107 (rev.) of the Bureau of Chemistry."

Estimation of the lime requirement of soils, J. A. BIZZELL and T. L. LYON (*Jour. Indus. and Engin. Chem., 5 (1913), No. 12, pp. 1011, 1012; abs. in Science, n. ser., 38 (1913), No. 983, p. 640*).—This is a modification of the Albert method (E. S. R., 23, p. 11), as follows:

"Place 25 gm. of the air-dried soil in a Jena Kjeldahl flask. Cover with 50 cc. boiled distilled water and add 50 cc. tenth-normal barium hydroxid solution. Digest in a briskly boiling water bath for one hour with occasional shaking. Remove from the water bath, add 150 cc. distilled water and 5 gm. solid ammonium chlorid. Connect the flask with a nitrogen distillation apparatus and distill. Collect the distillate (150 cc.) in tenth-normal acid and titrate, using methyl orange as indicator. The strength of the barium hydroxid is determined by titrating directly 50 cc. of the solution, using methyl orange as indicator. The difference between the two titrations, therefore, represents the amount of barium hydroxid absorbed by the soil. A correction is made for the slight decomposition of ammonium chlorid when heated with soil."

The estimation of citric acid-soluble phosphoric acid in Thomas slag powders according to the citrate and Lorenz methods, H. NEUBAUER (*Landw. Vers. Stat., 82 (1913), No. 5–6, pp. 465–475*).—The results obtained with the Lorenz method were found to agree with the true phosphoric acid content present in the fertilizer. It was furthermore noted that the presence of citric acid had no effect upon the results obtained by the Lorenz method.

The results given by the citrate method were always high even though the specifications proposed by Popp (E. S. R., 29, p. 410) were closely followed. The chief reason for the high results is said to be the precipitation of several milligrams of calcium oxid as tricalcium phosphate. As weighable amounts of phosphoric acid do not remain in the filtrate, due to the incomplete precipitation of this acid, compensation for the calcium weighed as phosphoric acid is not possible. The error is deemed greater in Thomas slag powder than that found in the estimation of the water-soluble phosphoric acid in superphosphates, inasmuch as slag powder contains much more calcium.

The loss in lecithin phosphoric acid, R. COHN (*Chem. Ztg., 37 (1913), No. 57, pp. 581–583*).—Lecithin is usually not entirely extracted by ether, consequently certain investigators, notably among them Hoppe-Seyler, recommend the use of alcohol in the method for the purpose of breaking up the lecithin protein complexes. According to theory adsorption of the lecithin by the coagulated proteins would not take place, but, on the other hand, such goods as egg yolk, baked goods containing eggs, lecithin preparations, etc., show a loss of their lecithin content extractable by ether as time goes on. If only cleavage took place, the amount of lecithin extractable by ether should be higher.

In order to determine whether this loss is really due to adsorption, fresh egg yolks were treated with dilute copper sulphate solution and 0.71 per cent (90 per cent) of the total lecithin was extracted by ether. Without the use of copper sulphate only 0.45 per cent of lecithin was obtained. Adsorption was found to take place when lecithin was added to white of egg, but when treated with alcohol and ether almost all of the entire amount added was recovered. Heating 20 hours at 100° C. was found to bring about a retrogression not only of the ether-soluble lecithin but also of the total lecithin phosphoric acid. The difficulty of extracting the total sulphuric acid in vulcanized rubber is stated as an analogous case. The author believes that the diminution of ether-soluble phosphoric acid can be explained by the adsorption theory.

Recommendations for the revision of the section on honey and honey surrogates (*Mitt. Lebensm. Untersuch. u. Hyg., Schweiz. Gsndhtsamt., 4 (1913),*

No. 2, pp. 67–76).—This deals with the methods for ripe, unripe, artificial, and sugar honey.

Contribution to our knowledge of foreign honeys, J. FIEHE and P. STEGMÜLLER (*Arb. K. Gsndhtsamt., 44 (1913), No. 1, pp. 78–149*).—This work is prefaced by abstracts of reports of consuls in regard to the sale of honey in Austria-Hungary, Russia, Spain, Portugal, Greece, the United States, Mexico, Brazil, Argentina, Chile, Cuba, Jamaica, and Australia. Cuba, the United States, Mexico, and Chile supply the greatest amount of honey to Germany.

The purpose of the investigation was to compare the variations which occur among the various constituents of foreign honeys with German honeys. The number of honeys examined was 112, and the tests made were organoleptic, as well as chemical and physical. All of the methods are described in detail and some are criticized.

The moisture determinations of 111 samples of foreign honeys with few exceptions compared well with the German product, varying between 14.94 and 24.28 per cent, with an average of 18.3 per cent. The invert sugar content varied between 61.96 and 78.84 per cent, with an average of 73.48 per cent. The honeys, with 3 exceptions, gave a levorotation. The saccharose content fluctuated between 0.12 and 15.4 per cent, with an average of 2.42 per cent. In 4 cases it exceeded 10 per cent, and these, according to the figures prescribed, were considered immature honeys. The sugar-free dry substance (all nonsugars inclusive of dextrin), for which the German standard is 1.5 per cent, varied between 1.75 and 13.42 per cent, with an average of 5.84 per cent. The acidity, expressed as formic acid, varied between 0.027 and 0.204 per cent, the requirement being 0.2 per cent. The protein precipitation, obtained by Lund's method, varied between 0.37 and 4.35 cc., with an average of 1.13 cc., although according to Lund this should be between 0.6 and 2.7 cc., with an average of 1.1 cc. Ley's reaction for detecting the presence of artificial invert sugar gave faulty results in 18 out of 88 cases, while Fiehe's method gave good results. The ash content varied between 0.027 and 0.673 per cent, with an average of 0.15 per cent. The highest ash content was noted with coniferous honeys, and the lowest with rosemary and thyme honeys. The standards call for from 0.18 to 0.8 per cent. Phosphates (determined after ashing) were present to the extent of from 0.0075 to 0.0932 per cent (calculated as P_2O_5), with an average of 0.0198 per cent. Calculated to 100 parts of ash the figures varied between 5.7 and 35.5 per cent.

Alkalinity of the ash, when titrated against azolitmin paper, was lower than when methyl orange is used as the indicator. This criterion is deemed valuable, since many sugars used for adulterating honey give a very low alkalinity figure.

Proposed method for detecting adulteration of cider vinegar with distilled vinegar, S. L. CRAWFORD (*Jour. Indus. and Engin. Chem., 5 (1913), No. 10, pp. 845–847*).—The principle of the method rests on the fact that cider vinegar contains an appreciable amount of a volatile substance which reduces Fehling's solution. Distilled vinegar, when diluted to 4 per cent acid, contains only traces of this substance.

"The proposed method is to take 50 cc. of sample, dilute to 250 cc., and distill over 200 cc. into a 250 cc. flask. Neutralize and make up to the mark. Take 50 cc. of this distillate and determine sugars by the method given in Bureau of Chemistry Bulletin 107. The result is given as invert sugar according to Munson and Walker's tables."

Analyses of authentic distilled and cider vinegars are included.

Detection of alkaloids in beverages, J. BODNÁR (*Kisérlet. Közlem., 16 (1913), No. 5, pp. 683–693*).—The Dragendorf method for the detection of alkaloids, as given in König's treatise (E. S. R., 15, p. 991), is criticized.

Tests in regard to the tannin substances in Malabar tea and the use of tannin in the preparation of tea, K. A. R. BOSSCHA and A. D. MAURENBRECHER (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Proefstat. Thee, No. 24 (1913), pp. 9–17*).—This deals with the tannin substances present in Malabar green tea leaves and with the effect which the addition of extraneous tannin before rolling has upon the ultimate quality of the tea.

The tannin substances were obtained in a pure state and tested with various reagents. From the mother liquor obtained after removing the lead acetate precipitate of tannin a substance was extracted which resembled gallic acid. The specific rotation of the tannin was not of the same magnitude as noted by Nanninga (E. S. R., 13, p. 823).

The tea, after being treated with tannin, rolled, and fermented, was submitted to a tea expert for judgment as to quality. The results varied considerably, and as the price of tannin is high its use in the preparation of tea is discouraged.

Proposals for the section on wine (*Mitt. Lebensm. Untersuch. u. Hyg., Schweiz. Gsndhtsamt., 4 (1913), No. 2, pp. 77–87*).—The definitions for various kinds of wines and the methods for their analysis are considered.

Recommendations for the revision of the section on spiritous liquors (*Mitt. Lebensm. Untersuch. u. Hyg., Schweiz. Gsndhtsamt., 4 (1913), No. 2, pp. 88–111*).—In this, recommendations are included for definitions and methods for judging distilled liquors.

Proposals for the section on milk products, exclusive of butter, of the Swiss food book (*Mitt. Lebensm. Untersuch. u. Hyg., Schweiz. Gsndhtsamt., 4 (1913), No. 2, pp. 49–66*).—These are the recommendations for the revision of the chapters relating to these products, including data as to cream, skim milk, buttermilk, whey, cow's milk, kefir, yoghourt and similar products, sweetened and unsweetened condensed milk, cheese, and infant foods. The methods and the standards are dealt with.

Nephelometric determination of proteins; casein, globulin, and albumin in milk, P. A. KOBER (*Jour. Amer. Chem. Soc., 35 (1913), No. 10, pp. 1585–1593, figs. 3*).—In this paper an accurate description and illustration of the nephelometer devised by the author is given. In addition some results of tests with the method and milks from different sources are presented which show close agreement with the figures obtained by the official method. The time for determining casein and the albumin-globulin fraction is reduced to 30 minutes.

The precipitants tried were acetic acid, half and entirely saturated magnesium sulphate and ammonium sulphate solutions, and a 3 per cent solution of sulphosalicylic acid. The most suitable precipitants are those which precipitate quantitatively and which do not agglutinate appreciably in less than 10 to 20 minutes. The method favored consists of precipitating the total proteins with sulphosalicylic acid solutions and determining the nephelometric index. Casein is determined by difference; it is first removed by the official method and the nephelometric index of the filtrate is noted. The fat is removed with ether and the membranes of the fat globules are dissolved with sodium hydroxid.

A new rapid method for the estimation of casein in milk, W. O. WALKER (*Ann. Rpts. Dairymen's Assocs. Ontario, 1912, pp. 36–38*).—Briefly the method consists of estimating with ninth-normal potassium hydroxid the acids liberated from casein through the agency of formaldehyde.

For conducting the test 16.3 cc. of the milk is placed in a beaker with 1 cc. of 1:500 phenolphthalein and the acidity is neutralized with standard alkali, care being taken that the color is brought to a good deep pink. Two cc. of neutral formaldehyde solution, 40 per cent, is then added and the mixture titrated with standard alkali solution until the pink coloration reappears. The number of cubic centimeters of alkali used represents the percentage of casein in the milk.

The time required for the test is about 2 minutes. The test is recommended as a basis for paying for milk in cheese factories.

The analysis of unsweetened evaporated milk, C. A. A. Utt (*Jour. Indus. and Engin. Chem., 5 (1913), No. 2, pp. 168, 169*).—The sample is mixed and if fat is seen on the surface, it is necessary to warm it after adding a little sodium hydroxid. For the estimation of the fat, weigh 4.5 gm. of the milk into a 10 per cent Babcock bottle with from 6 to 8 cc. of sulphuric acid (specific gravity 1.8); shake until a chocolate brown color is obtained, and place for from 15 to 20 minutes in boiling water. After cooling add hot dilute sulphuric acid 1:1 until the bottle is two-thirds full, and centrifuge for 5 minutes. "Fill to the neck with hot, half-strength sulphuric acid and whirl 3 minutes. Add hot water to bring the fat column into the neck of the bottle and whirl 2 minutes. Read at 120 to 125° F. from the bottom of the column to the extreme top of the meniscus. The reading multiplied by 4 gives the percentage of fat."

Laboratory and field assay of arsenical dipping fluids, R. M. Chapin (*U. S. Dept. Agr. Bul. 76 (1914), pp. 17, fig. 1*).—There are various factors which tend to render arsenical dipping fluids of uncertain composition. Chiefly amongst these are the use of low grade chemicals in their preparation, evaporation, or leakage from the bath, oxidation of arsenious oxid to arsenic acid, especially through the agency of micro-organisms, and the converse phenomenon of reduction to arsenate. There is therefore needed an analytical control of the dipping solutions, and laboratory tests are described for actual arsenious oxid and total arsenic, which can be executed by persons who have but a limited training in chemistry. In addition a portable testing outfit is described which has been devised for bureau inspectors in the field and with which it is possible, without any chemical knowledge whatever, to determine, at the side of the vat and in a few minutes, the strength of the arsenical solution prepared according to the standard formula. The apparatus required is illustrated and the criterions for judging the results obtained by the methods are stated.

Determination and detection of methyl alcohol, T. von Fellenberg (*Mitt. Lebensm. Untersuch. u. Hyg., Schweiz. Gsndhtsamt., 4 (1913), No. 3, pp. 122–146, figs. 2*).—This deals with a quantitative physical method for determining methyl alcohol, which in principle is similar to that used by Röse in determining higher alcohols. It is shown that if a solution containing a definite percentage of alcohol is shaken with ether, the point at which the ether-water, etc., solution separates differs with the kind of alcohol present. With methyl alcohol the water-alcohol layer becomes greater while with ethyl alcohol it becomes less.

For the method a special form of apparatus has been devised. Its use for detecting methyl alcohol in brandies is shown, and the work includes a method for concentrating solutions containing methyl alcohol, which is done by salting out the ethyl alcohol and higher alcohols with potassium hydroxid. This allows the detection of 1:100,000 parts of methyl alcohol by the Denigés method. Methyl alcohol is also shown to be a product resulting from the fermentation of fruit residues.

Research studies on the curing of leaf tobacco, W. W. Garner, C. W. Bacon, and C. L. Foubert (*U. S. Dept. Agr. Bul. 79 (1914), pp. 40*).—This is a

study of the chemical and physiological changes which occur in tobacco during the process of drying the ripe leaf is a specially constructed barn and under such conditions as will develop the desired properties or qualities. Very little attention has been paid to this phase of tobacco curing and most of the investigations deal with fermentation or after-fermentation or to certain special phases of the subject.

Curing is considered essentially a vital process, and this seems to be proved by the fact that killing the protoplasm at very low or high temperatures or with poisons, such as chloroform, prevents normal curing. Imperfect curing can not, therefore, be fully corrected by subsequent fermentation.

The results of experiments covering several years show the loss in weight of dry matter in air curing when the leaf is primed (leaves picked from the stalk as they mature or "ripen" and arranged on strings or sticks suitable for hanging in the curing shed) or cured on the stalks, and were confined to the cigar-wrapper leaf section of Connecticut. The types of tobacco included in the experiments were Havana Seed, Halladay, and a so-called John Williams broadleaf. It was found that "the average loss in weight of dry matter in curing the picked leaves is 12 to 15 per cent, while in curing the leaves on the stalk the loss in dry weight is approximately twice as great. In other words, a cigar-wrapper leaf picked from the stalk will weigh after curing approximately 14 to 18 per cent more than would the same leaf when cured on the stalk. In the curing of the export and manufacturing types and of cigar-filler types, which are harvested in a riper or more mature condition, the loss in weight of dry matter is greater than in the case of cigar-wrapper leaf, frequently amounting to 35 to 40 per cent, even when the leaves are picked from the stalk in harvesting."

In a 4-year experiment the content of pure ash of cured leaves was higher than the uncured leaves and in proportion to the loss in dry weight. While the green leaves contained considerable and variable amounts of starch, the cured leaves were practically free, as shown by the iodin test. The cigar-wrapper leaf types contain less starch at the time of harvesting than other commercial types of leaf, because they are at a less mature stage when harvested and are produced under conditions less favorable to the accumulation of starch during the ripening period. "One of the most marked physiological differences between the green and cured leaves is the content of protein insoluble in dilute acid. In all cases the protein content of the cured leaves is much less than that of the uncured leaves. The content of nitric acid in the green and in the cured leaves is about the same. The green leaves at most contain only traces of ammonia, while the cured leaves contain considerable quantities. The cured leaves contain relatively much larger quantities of amid and amido compounds than the green leaves. The relative content of total nitrogen is somewhat less in the green than in the cured leaves."

The changes produced in the leaf harvested on the stalk were the same as in the leaf harvested by priming. In a 3-year experiment the composition of cigar-wrapper leaf cured on the stalk and the uncured leaf were compared. "As in the primed leaves, the ash content of the whole leaf is higher in the cured than in the uncured leaves. The cured leaves are again practically free from starch and reducing sugars, except where the curing was incomplete. The difference as regards protein is similar to those noted in the cured and uncured leaves in the preceding experiments. The differences with reference to amid and amido compounds are somewhat variable, but it is evident that the cured leaf does not contain appreciably larger quantities of these constituents, relatively, than the green leaf, and the same is true as to ammonia. It is clear that the cured leaves contain considerably less total nitrogen than the green leaves."

The changes taking place in the leaf top in air curing consist of an entire loss in starch and reducing sugars, a decrease of pentosans and malic acid, and an increase in citric acid, while the cellulose content remains unchanged. "There is a large decrease in protein, in some cases amounting to 60 per cent of the total, and a considerable decrease in nicotin and total nitrogen. Appreciable quantities of ammonia are formed in the process. In the curing of picked leaves the chemical changes appear to be due almost wholly to respiration, while in curing the leaves on the stalk the phenomenon of translocation from the leaf into the stalk plays an important rôle. This translocation, which constitutes the essential physiological difference in the two methods of curing involves the transfer into the stalk of the amid and amido compounds derived from the protein, ammonia, and a portion of the mineral constituents, nitrate, and, doubtless, a portion of the carbohydrates. The picked leaves after curing contain, therefore, much larger quantities of amid and amido compounds, and ammonia, and somewhat larger quantities of mineral matter and nitrate than the leaves cured on the stalk.

"The physiological processes characteristic of tobacco curing indicate the presence of diastatic, proteolytic, and deamidizing enzyms, and probably also of oxidases. The process of starvation to which the leaves are subjected leads to an increased secretion of diastase during the progress of the curing. Temperature has a very marked effect on the rate of curing. The rate of curing increases very rapidly with rise in temperature up to the killing point of the protoplasm (about 130° F.). The moderate use of artificial heat in air curing does not materially affect the final result in curing so far as measured by the ordinary methods of chemical analysis, provided other conditions remain favorable in both cases. Thorough wilting in the initial stages of the curing promotes the progress of the process, provided the further drying of the leaf is not allowed to proceed too rapidly."

The experimental error in sampling sugar cane, J. W. Leather (*Mem. Dept. Agr. India, Chem. Ser., 3 (1913), No. 4, pp. 107–133, fig. 1*).—The results tabulated are those obtained in the experimental grounds at Pusa and a sugar factory at Parsa, India.

The clarification of Louisiana cane juices, W. E. Cross (*Louisiana Stas. Bul. 144 (1914), pp. 39*).—The studies recorded in this bulletin deal with the sulphitation and the carbonation processes for the clarification of cane and beet juices. They were carried on in the laboratory and sugarhouse of the Sugar Experiment Station, and preliminary reports on certain parts of the work have already appeared in the scientific literature. A chapter on treating sirup is also included.

METEOROLOGY—WATER.

Meteorological observations, J. S. Stevens (*Maine Sta. Bul. 222 (1913), pp. 319, 320*).—Observations at Orono, Me., on temperature, precipitation, cloudiness, and wind during 1913 are compared with the means of similar observations for 45 years. The mean temperature for 1913 was 45.45° F., the mean for 45 years 42.57°; the precipitation for 1913 was 44 in., for 45 years 43.33 in.; the snowfall for 1913 was 34.3 in., for 45 years 90.4 in.; the number of days on which there was a precipitation of 0.01 in. or more was 112, the number of clear days 126, and the number of cloudy days 140; and the total movement of wind in miles, 52,484.

Surface water supply of the Missouri River Basin, 1911, W. A. Lamb, W. B. Freeman, and R. Richards (*U. S. Geol. Survey, Water-Supply Paper 306 (1914), pp. 374, pls. 4*).—This paper presents results of measurements of

flow made on the Missouri River proper and tributary basins during 1911. Tables are included giving gage heights and daily and monthly discharges at each station. Information is also given regarding the legal aspects of the appropriation of water, particularly for irrigation purposes.

Surface water supply of the Colorado River Basin, 1911, R. FOLLANSBEE, W. B. FREEMAN, and G. C. BALDWIN (*U. S. Geol. Survey, Water-Supply Paper 309 (1914), pp. 266, pls. 4*).—This paper presents results of measurements of flow made on Green River and the main Colorado River and tributary basins. Tables are included giving gage heights and daily and monthly discharges at each station. A report is also given of the flood of October, 1911, in the region of the San Juan, San Miguel, and La Plata Mountains, which resulted in severe agricultural losses.

Surface water supply of the South Atlantic coast and eastern Gulf of Mexico Basins, 1912, W. E. HALL and C. H. PIERCE (*U. S. Geol. Survey, Water-Supply Paper 322 (1914), pp. 98, pls. 4*).—This paper reports the results of measurements of flow made during 1912 in the James, Roanoke, Yadkin, Savannah, Santee, and Altamaha River Basins on the South Atlantic coast, and in the Apalachicola, Choctawhatchee, Escambia, Mobile, and Pearl River Basins of the east coast of the Gulf of Mexico. Tables are also included giving gage heights and daily and monthly discharges at each station.

SOILS—FERTILIZERS.

Treatise on soils for farmers and foresters, E. A. MITSCHERLICH (*Bodenkunde für Land- und Forstwirte. Berlin, 1913, 2 rev. ed., pp. XI+317, figs. 35*).—In this complete revision of his previous work (E. S. R., 17, p. 838), the author incorporates the more important results of progress in soil investigation during the past seven years. In recognition of the pronounced tendency during this period to develop physiological soil study in place of geological and physical soil investigations, the author treats the subject largely from the former viewpoint and emphasizes only those chemical and physical properties of soil which condition plant growth.

Various conceptions of the law of minimum figure prominently in the treatment of the subject. Liebig's law of minimum is used qualitatively, but in view of the importance of a quantitative plant-physiological study of soils which is especially emphasized, the work is based chiefly on the author's quantitative conception of the law of minimum which is explained in its various applications to soil study.

The work is divided into two parts, the first treating the theoretical side of the subject in which soil energy, in the form of heat, and soil water are considered as the physical factors of plant growth, and the different plant foods as chemical factors. It is attempted to determine definitely on what specific properties of the soil these factors depend and, as far as possible, the particular influence which each factor exerts on plant growth.

The second part summarizes the practical application of the physical and chemical factors and conditions dealt with in the first part, in the cultivation, improvement, and judging of soils, and in measures used by practical farmers and foresters in their work. For convenience in this respect, soils are divided into three types among which there is considered to be a distinct transition, namely, light soils of which dry sandy and damp moor soils are subdivisions, medium soils, and heavy soils, particularly tenacious clays.

Mathematical tables and formulas useful in the study of soils, are appended.

Moor cultivation in Austria, W. BERSCH (*Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1913), No. 11, pp. 1672–1677*).—The

proper measures in the cultivation of these moors are pointed out briefly as potash and phosphoric acid fertilization, applied in the spring, liming, fall plowing, sufficient but not excessive tile drainage, and green manuring.

The fertility map of the Delta, B. F. E. KEELING (*Cairo Sci. Jour., 8 (1914), No. 88, pp. 1–3*).—A brief description is given of the survey of the Delta of the Nile, with reference to the agricultural value of the lands, which is now in progress. The lands are being classified as good, medium, bad, uncultivated, and under reclamation. The agricultural value of the lands is determined to a large extent by the amount of alkali they contain.

Soils, H. J. VIPOND (*Union So. Africa Dept. Agr. Repl. 1912–13, pp. 297–304*).—The results of chemical analyses of a number of samples of soils from different parts of South Africa are similar to those previously noted (E. S. R., 29, p. 514), the average percentage of nitrogen being fair, and of lime and available phosphoric acid very low, and the only noteworthy difference being an increase in total and available potash.

Analyses of ten samples of alkaline soils showed the presence of considerable amounts of sodium carbonate and bicarbonate, and a smaller amount of sodium chlorid.

Laterite, its consideration in the light of colloid chemistry, A. LUZ (*Kolloid Ztschr., 14, (1914), No. 2, pp. 81–90*).—The author briefly reviews a number of opinions regarding the origin, formation, and composition of laterite, showing the variation and development in these views during the past century. The more recent general opinion is that laterite is a product of advanced weathering of materials containing crystalline aluminum silicates which, in the process of laterization, have been transformed by degrees into complexes containing, first, colloidal aluminum silicates and colloidal iron hydroxid; second, colloidal aluminum hydroxid, colloidal silica, and colloidal iron hydroxid; and, third, crystalline aluminum hydroxid, colloidal silica, and crystalline limonite.

Critical remarks on the determination of the adsorptive power of the soil, T. ORYNG (*Kolloid Ztschr., 14 (1914), No. 2, pp. 105–108*).—In connection with other criticisms of views regarding colloid chemistry the author points out the narrow limits within which the colorimetric method is of value for determining the adsorptive surfaces and power of soils.

The influence of irrigation and crop production on soil nitrification, I. G. MCBETH and N. R. SMITH (*Centbl. Bakt. [etc.], 2. Abt., 40 (1914), No. 1–8, pp. 24–51, figs. 6*).—This is an account of investigations, carried on in cooperation between the Bureau of Plant Industry of this Department and the Utah Experiment Station, which were made with soils of the irrigated experiment farm of the station. The results are summarized as follows:

"The application of irrigation water reduced the nitrifying power of the soils as determined by laboratory methods.

"The plats continuously cropped to alfalfa, potatoes, oats, and corn all showed a higher nitrifying power than the corresponding fallow plats. The stimulating effect of crop production on the nitrifying power of the soils was most marked in the alfalfa land.

"The nitrifying power of the soils was very weak below the second-foot zone, and almost no increase in nitrates was secured below the fifth-foot zone. About 90 per cent of the nitrate formed in the first 5 ft. was produced in the upper 18 in. The application of irrigation water did not change the relative nitrifying power of the different foot sections.

"The moisture content of the nonirrigated plats during the summer months fell far below the quantity required for active nitrification. No increase in nitric nitrogen took place when the soil samples contained as little as 5 per cent of moisture.

"The addition of a quantity of nitrogen as ammonium sulphate greater than 170 parts per million to each 100 gm. of soil sample showed an inhibiting action on the nitrifying organisms."

The formation and decomposition of humus as well as its action on nitrogen assimilation, F. LÖHNIS and H. H. GREEN (*Centbl. Bakt.* [*etc.*], *2. Abt., 40 (1914), No. 1–8, pp. 52–60; abs. in Chem. Zentbl., 1914, I, No. 12, pp. 1212, 1213*).—Experiments are reported in which stable manure, green manure, straw, peat, and sugar were mixed with sand in the proportion of 1:10 and allowed to undergo humification for 4½ months both with and without access of air.

The process was most rapid with stable manure, somewhat slower with green manure, and slowest with straw. The sugar yielded almost no humus and the peat underwent a slight oxidation. Partial aeration was most favorable to humification. With full aeration a considerable part of the nitrogen of stable manure and green manure was nitrified. At the same time, in the case of green manure there was a large loss of free ammonia.

Substances obtained from the humified materials by treatment with soda solution and hydrochloric acid were mixed with soil and allowed to undergo nitrification for five weeks. In this way characteristic differences were observed. The largest amount of nitrate was obtained from the green manure humus, but practically identical results were obtained with humus derived from stable manure subjected to aeration. On the other hand, humus derived from stable manure without aeration yielded much less nitrate. The nitrogen compounds of peat humus were nitrified to a very slight extent. The straw humus interfered with the nitrification process in the same manner as undecomposed straw.

The fixation of nitrogen by Azotobacter in mannite solution was appreciably promoted by the addition of small amounts of humus (0.2 per cent). The stable manure humus was especially favorable to such fixation. The other forms of humus gave very nearly the same results, not only among themselves but as compared with soil extract rich in iron. The favorable effect on nitrogen fixation appeared to be due more to an improvement of the nutrient medium in chemical properties than to increased adsorption of oxygen and nitrogen. In the latter direction the experiments showed no pronounced differences.

The effect of copper, zinc, iron, and lead salts on ammonification and nitrification in soils, C. B. LIPMAN and P. S. BURGESS (*Univ. Cal. Pubs., Agr. Sci., 1 (1914), No. 6, pp. 127–139*).—Experiments carried out by the direct soil culture method, described in a previous article (E. S. R., 26, p. 322), led to the conclusion that "copper, zinc, iron, and lead exercise toxic effects on the ammonifying flora of a sandy soil from southern California in all concentrations, ranging from 50 to 2,500 parts per million of their sulphates; such toxicity is relatively small, however, and is more marked at concentrations below 0.1 per cent than above it, in most cases; the metals named exercise no stimulating effect on the ammonifying flora at any concentration. Copper, zinc, iron, and lead exercise marked stimulating effects on the nitrifying flora of the same soil and frequently more than double the normal nitrate yield; the same metals may in very small concentrations exercise toxic effects on the nitrifying flora or no effect at all, but they are markedly stimulating at much higher concentrations; with the one exception of lead sulphate, the metals named showed very marked stimulation for nitrification even at 0.15 per cent, the highest concentration employed . . . A brief discussion is given of possible causes for the effects of the metallic salts under consideration on the soil flora."

The decomposition of silicates by soil bacteria and yeasts, II, K. BASSALIK (*Ztschr. Gärungsphysiol., 3 (1913), No. 1, pp. 15–42; abs. in Centbl. Bakt. [etc.], 2. Abt., 40 (1914), No. 9–10, pp. 193, 194*).—Orthoclase, microcline, oligoclase, labradorite, nephelin, leucite, potash mica, magnesia mica, olivine, augite, hornblend, tourmaline, and apatite were subjected in fine powdered condition to the action of *Bacillus extorquens*, a crude culture of nitrite bacteria, a crude culture of butyric-acid bacteria (*Clostridium pasteurianum*), and beer yeast.

The solvent action of *B. extorquens* was greatest in the case of nephelin, magnesia mica, and augite, of which from 4 to 6 per cent was dissolved while only about 2 per cent was dissolved in the case of the other minerals. The butyric-acid bacteria gave like results, except that they showed a special capacity for decomposing apatite. *B. extorquens* produced in from 100 to 200 days carbon dioxid equivalent to from three-fourths to four-fifths of the total weight of the mineral. The beer yeast produced about twice as much carbon dioxid as *B. extorquens*, but its solvent action was relatively small. On the other hand the nitrite bacteria, although producing a relatively small amount of acid, showed a comparatively high solvent power.

The results indicate that in the solution of phosphorite the organic acids are of special importance.

A list of references to literature of the subject is given.

Nitrogen assimilation in the presence of nitrates, II. PRINGSHEIM (*Centbl. Bakt. [etc.], 2. Abt., 40 (1914), No. 1–8, pp. 21–23*).—Experiments are reported which showed that with a sufficient supply of energy-producing materials nitrogen was fixed by *Clostridium americanum* in the presence of nitrates, although to a less extent. Nitrogen fixation was increased by the presence of *Penicillium glaucum* in the colostrum culture.

The chemical composition of the cells of Azotobacter chroococcum, W. L. OMELIANSKY and N. O. SIEBER (*Hoppe-Seyler's Ztschr. Physiol. Chem., 88 (1913), No. 6, pp. 445–459; abs. in Jour. Chem. Soc. [London], 106 (1914), No. 616, I, p. 235*).—The characteristic dark brown growth of this organism obtained in agar cultures containing the usual mineral salts with 2 per cent dextrin after about six days' incubation at 30° C. was dried rapidly at 30° C. and analyzed. The material was found to contain 6.63 per cent of water, 4.16 per cent of ash, and 12.92 per cent of protein.

The nature of the nitrogen-free substance was not determined, but it appeared to belong to the polysaccharids. Among the products of hydrolysis, lysin was found in larger proportion than arginin, with only minute traces of histidin.

The behavior of soils sterilized by heat, VOGEL (*Centbl. Bakt. [etc.], 2. Abt., 40 (1914), No. 11–13, pp. 280–284*).—Sodium nitrate in a sterile 5 per cent solution remained unchanged when added to unsterilized soils and to soils sterilized for 30 minutes at two atmospheres in the autoclave but was rapidly reduced to nitrite in the sterilized soils when they were inoculated with cultures of denitrifying organisms. Steaming of soils at 100° C. for different periods did not prevent subsequent nitrate reduction. It is concluded that simple steaming of soils effects incomplete sterilization and that nitrate reduction following supposed sterilization is due to certain denitrifying organisms which survive the steaming and become active, rather than to chemical agencies.

Bacteriological studies of field soils.—III, The effects of barnyard manure, P. E. BROWN (*Centbl. Bakt. [etc.], 2. Abt., 39 (1913), No. 20–22, pp. 523–542*).—The author briefly reviews investigations by others, and in continuation of previous experiments (E. S. R., 28, p. 120) reports studies of the effect of treatment with barnyard manure on the bacterial activities in loam soil under field conditions, and also on the relation between bacterial activities and actual crop yields. The soil was treated with 8, 12, 16, and 20 tons of manure per acre.

Applications of manure up to 16 tons per acre increased the number of organisms in, and also the ammonifying and nitrifying powers of the soil. The greatest increases occurred between the untreated soil and that receiving 8 tons per acre, and between the latter and that to which 12 tons per acre were applied. "In most cases only a very slight increase occurred in the soil on which 16 tons were used over that where 12 tons were added. Twenty tons of manure per acre caused a depression in numbers of bacteria, in ammonifying power, and in nitrifying power, . . . the results being lower than those secured when 12 tons per acre were added." There was a close relationship between the ammonifying power of the soils and the number of organisms present.

Albumin agar permitted of the development of larger numbers of soil organisms, and also a greater differentiation between the soils of the various plats, than the modified synthetic agar. "The casein fresh soil method of testing the ammonifying power of the soil was the simplest, permitted of the greatest differentiation between different soils, and in general was the most satisfactory. The ammonium sulphate fresh soil method for testing the nitrifying power of the soil showed the greatest differences between the various soils and is recommended as the more rational method.

"The nitrifying power and the ammonifying power of the soil . . . proceeded in the same direction.

"Applications of manure up to 16 tons per acre increased the yield of corn from the plats in this series, the greatest increases occurring between the [untreated] plat and that receiving 8 tons per acre, and between the latter and the plat to which 12 tons per acre were added. A very slight further increase occurred when 16 tons per acre were applied. Twenty tons of manure per acre depressed the crop yield below that obtained when 12 tons per acre were added.

"The results of the bacteriological tests and the crop yields coincided almost exactly, [indicating] . . . that there is a close relationship between bacterial activities and the fertility or crop-producing power of soils. The depression in crop yields and bacterial activities caused by 20 tons of manure per acre can not be attributed to denitrification, as tests by the Giltay solution method and the soil method give no evidence of losses of nitrogen. The depression must therefore be due to physiological or other causes."

Farm manures, P. E. BROWN (*Iowa Sta. Circ. 9 (1913), pp. 3–16, figs. 2*).—This is a popular presentation of the character, value, and importance and methods of using manure of farm animals.

Green manuring and soil fertility, P. E. BROWN (*Iowa Sta. Circ. 10 (1913), pp. 3–15, figs. 6*).—The value and importance of green manuring, especially for Iowa soils, are popularly presented.

[Cave deposits, manures, limes, and limestones], H. J. VIPOND (*Union So. Africa Dept. Agr. Rpt. 1912–13, pp. 304, 305*).—Analyses of these materials for fertilizing constituents are reported.

Report of the superintendent of the guano islands, W. R. ZEEDERBERG (*Union So. Africa Dept. Agr. Rpt. 1912–13, pp. 351–355*).—The guano islands, lying mainly along the west and southwest coasts of South Africa, yielded during 1912 6,372½ tons of guano having the following average composition: Nitrogen 11.51 per cent, potash 2.20, phosphoric acid soluble in water 3.04, phosphoric acid soluble in citrate solution 9.25, total phosphoric acid 9.62, and lime 9.66 per cent. The supply was much less than the demand for home consumption.

Peat, C. A. DAVIS (*U. S. Geol. Survey, Mineral Resources of the United States, 1912, pt. 2, pp. 497–501*).—This article deals briefly with the production

and consumption of peat in the United States and the preparation and use of peat fuel in Europe.

It is stated that the output of peat fuel in the United States in 1912 was 1,300 tons. The production for use as fertilizer was 41,080 tons. Approximately 3,000 tons was used for mixing with prepared stock foods, and 2,000 tons for the production of paper stock. The total production for all purposes was 47,380 tons. The imports, mainly peat stable litter from Holland, amounted to 9,053 tons.

Results of drilling manures in Hungary, C. KERPELY (*Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1913), No. 11, pp. 1696–1703*).—The results of experiments on farms in different parts of Hungary in comparing the effect of drilling and broadcasting superphosphate and other fertilizing materials on winter wheat and rye, spring barley, oats, wheat, and sugar beets are summarized in this article.

It was found, as a rule, that drilling was more effective than broadcasting in increasing the yield and was more economical of fertilizer. No injurious effect on germination was observed even when quantities as large as 232 lbs. per acre of superphosphate were drilled in with the seed in both wet and dry seasons, although the superiority of drilling was more pronounced in the dry season. The yield of both straw and grain and the quality of the grain was improved by drilling.

The beneficial effect of drilling was especially marked in the case of sugar beets. In cases in which sugar beets did not respond at all to broadcast fertilizing a small quantity of the fertilizers drilled with the seed was very effective. With this crop sodium nitrate and potash salts were used in addition to superphosphate. An injurious effect of the nitrate was observed only when it was used in amounts exceeding 93 lbs. per acre. Moderate applications of potash salts applied in the drill had no injurious effect on germination and were more effective than broadcast applications. Drill applications did not decrease the sugar content of the beets, but on the contrary in some cases increased it.

It is stated that the results were so convincing that it is probable that the system of fertilizing in the drill will be generally adopted in agricultural practice in Hungary.

Experimental results obtained of recent years by the section of agricultural chemistry of the Central Agricultural Experiment Station of Stockholm, H. G. SÖDERBAUM (*Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1913), No. 11, pp. 1677–1681*).—A brief review is given of experiments with nitrogenous, phosphatic, and miscellaneous fertilizing materials which have been noted from time to time in the *Record*.

Do fertilizer salts have an influence in forming soil crusts? H. HESSLER (*Besteht ein Einfluss der Düngesalze auf die Verkrustung? Diss. Univ. Gissen, 1912, pp. 41*).—The coherence was determined of cylinders of soil of different chemical and physical properties which had been mixed with solutions of varying strengths of sodium nitrate, salt, kainit, 40 per cent potash salt, and sylvin, as well as with potash and soda solution and tap and distilled water, and then dried at 70° C.

As a rule the salts tested increased the coherence of the soil, the most active in this respect being salt, followed in descending order by sodium nitrate, sylvin, kainit, and potash. The effect of the salts varied widely with the character of the soil, being especially dependent upon the size of the soil particles and the proportion of colloid substances present.

Field experiments on the availability of nitrogenous fertilizers, J. G. LIPMAN, A. W. BLAIR, ET AL. (*New Jersey Stas. Bul. 260 (1913), pp. 3–33, pls. 5*).—Supplementing cylinder experiments previously reported upon (E. S. R., 28, p. 725), an attempt was made "to show the relative availability of nitrogeneous fertilizer materials, and the influence of lime on the availability of soil organic matter, by means of field experiments conducted on 1/20-acre plats, with a rotation of corn, oats, wheat, and grass."

The experiments here reported were made on a fairly heavy loam soil and covered one 5-year rotation (1909–1913). The nitrogeneous fertilizers used (equivalent to 16 lbs. of sodium nitrate per plat) included sodium nitrate, calcium nitrate, calcium cyanamid, ammonium sulphate, dried blood, tankage, and dried fish besides horse and cow manure and leguminous and nonleguminous green manures, with a basal fertilizer of acid phosphate and potassium chlorid. One series of plats received 1 ton per acre of ground limestone at the beginning of the rotation; the other was unlimed.

Analyses of the soil at the beginning and end of the rotation "indicate that the plats have lost in total nitrogen, even those which have each year received heavy applications of manure and commercial nitrogeneous fertilizers. The limed plats have lost nitrogen to a greater extent than the unlimed plats. . . . All plats are now distinctly acid, requiring from 1,000 to 2,200 lbs of lime (CaO) per 2,000,000 lbs. of soil to correct the acidity. The present lime requirement of the plats which were limed in the beginning is, on an average, about 700 lbs. per acre less than that of the unlimed plats."

Volunteer clover was more abundant and richer in nitrogen on the limed plats, as was the yield of dry matter and the percentage of nitrogen recovered, in nearly all cases in the first crop after liming but not thereafter.

"The percentage of nitrogen in the dry matter was generally highest on those plats that received the heaviest application of nitrogen, as, for example, those that received both manure and nitrate of soda. The average percentage of nitrogen in the dry matter was practically the same on the limed and unlimed plats.

"The average percentage of nitrogen recovered for the first crop was more than twice as high on the limed as on the unlimed plats. For the succeeding crops the average recovery did not differ much on the two sections. The highest average recovery for the five years, unlimed, was 49.99 per cent, with ammonium sulphate, and the next highest, 43.98 per cent, with nitrate of soda. The highest average recovery for the limed plats was 55.76 per cent, with calcium nitrate, and the next highest, 47.93 per cent, with ammonium sulphate.

"The average recoveries with the nitrates, ammonium sulphate, and calcium cyanamid were distinctly higher than with an equivalent amount of nitrogen in the form of dried blood, fish, and tankage.

"Although the largest yields of dry matter were obtained from plats receiving manure and manure with nitrate of soda, the recoveries from these plats were lower than the recoveries from plats that received dried blood, fish, and concentrated tankage. They are likewise lower than the recoveries from plats that received their nitrogen in the form of green alfalfa. The plats receiving green alfalfa and nitrate of soda have given higher yields of dry matter and higher recoveries of nitrogen than plats receiving blood, fish, and tankage."

In general "results point to a higher availability, and a higher percentage recovery, for nitrogen in the form of calcium and sodium nitrate, ammonium sulphate, and calcium cyanamid than for nitrogen in the form of dried blood, fish, and concentrated tankage."

Phosphatic fertilizers, A. GRÉGOIRE (*Rev. Econ. Internat., 11 (1914), I, No. 2, pp. 359–376*).—The history and present status of the use of phosphatic fertilizers are briefly reviewed.

Action of ammonium citrate on mono, di, and tricalcium phosphates, T. WARYNSKI and J. LANGEL (*Ann. Chim. Analyt., 19 (1914), No. 1, pp. 1–6; abs. in Jour. Soc. Chem. Indus., 33 (1914), No. 3, p. 153*).—It was found that all three phosphates are soluble to an appreciable extent in ammonium citrate solution, and so can not be accurately separated by the use of this solvent. Solution was found to be complete in about an hour. The greatest differences in solubility of the phosphates were observed when extraction was made in the cold and the citrate solution was saturated.

Superphosphate vinasse, a new fertilizer, H. STOLTZENBERG (*Chem. Ztg., 38 (1914), No. 8, pp. 81, 82; abs. in Jour. Soc. Chem. Indus., 33 (1914), No. 3, p. 153; Chem. Zentbl., 1914, I, No. 12, p. 1213*).—Vinasse is considered a valuable fertilizer on account of its high nitrogen and potash content, but it was found that the residue from the evaporation of beet pulp is too hygroscopic on account of the presence of bases, such as betain, for use as a solid manure. When 2.5 parts of the pulp was used with 3 parts of the superphosphate a friable mass was obtained which could be kept for months without change. This material contained 2.25 per cent of nitrogen, 6.33 of potash, 11.53 of citrate-soluble phosphoric acid, and 8.48 per cent of water-soluble phosphoric acid. One-half of the material was soluble in water and 30 per cent of it consisted of unaltered organic matter.

Potash salts: Summary for 1912, W. C. PHALEN (*U. S. Geol. Survey, Mineral Resources of the United States, 1912, pt. 2, pp. 877–908*).—A brief account is given of progress in investigations during 1912 by the U. S. Geological Survey and the Bureau of Soils of the U. S. Department of Agriculture with regard to the discovery of new sources of potash in the United States.

A bibliography of recent papers on the subject is appended.

Lime, R. W. STONE (*U. S. Geol. Survey, Mineral Resources of the United States, 1912, pt. 2, pp. 651–668*).—Statistics of production and consumption of lime and data regarding the occurrence of limestone in the United States are summarized in this article. The total production in 1912 was 3,529,462 tons, an increase of 136,547 tons over that produced in 1911. There was a marked decline in price of lime and a decrease in the number of producers during the year.

A bibliography of recent papers on the subject is appended.

Gypsum, R. W. STONE (*U. S. Geol. Survey, Mineral Resources of the United States, 1912, pt. 2, pp. 637–649*).—Statistics of production and consumption in the United States and other countries are summarized. The total production in the United States in 1912 was 2,500,757 tons, an increase of 176,787 tons over the amount mined in 1911. Of this 53,065 tons was sold for use as land plaster.

A bibliography of recent papers on the subject is appended.

The composition and agricultural value of carbonate of lime from causticizing plant, J. HENDRICK (*Jour. Soc. Chem. Indus., 33 (1914), No. 3, pp. 122–126*).—This is a full account of analyses and field experiments which have already been noted (E. S. R., 30, p. 127).

Liming Iowa soils, P. E. BROWN (*Iowa Sta. Circ. 2, 2. ed. (1913), pp. 3–8, pl. 1*).—This is a popular discussion of the subject.

The action of sulphur on the bacterial activities of the soil, J. VOGEL (*Centbl. Bakt. [etc.], 2. Abt., 40 (1914), No. 1–8, pp. 60–83; abs. in Chem. Zentbl., 1914, I, No. 12, p. 1212*).—Experiments are reported which indicate quite positively a decided effect of sulphur in promoting various bacterial activities in the soil, such as ammonification, nitrification, and nitrogen fixation.

The so-called "catalytic action" of manganese and boron compounds on the cultivation of the sugar beet, H. PELLET (*Bul. Assoc. Chim. Sucr. et Distill., 31 (1913), No. 6, pp. 419–424; abs. in Jour. Soc. Chem. Indus., 33 (1914), No. 3, p. 153; Chem. Zentbl., 1914, I, No. 8, p. 807; Chem. Ztg., 38 (1914), No. 11, Report., p. 47*).—Experiments at the Rovigo Experiment Station in Italy are referred to as showing that manganese and boron compounds, both singly and in combination with aluminum compounds, had no effect on the growth or yield of the sugar beet or on the purity of its juice. The reliability of results of other experiments indicating favorable effects from the use of these compounds is questioned.

The fertilizer inspection for 1913, B. E. CURRY, T. O. SMITH, ET AL. (*New Hampshire Sta. Bul. 167 (1913), pp. 11*).—Analyses of 187 samples of fertilizers sold in the State during the year are reported.

Analyses and valuations of commercial fertilizers and ground bone, C. S. CATHCART ET AL. (*New Jersey Stas. Bul. 261 (1913), pp. 3–64*).—This bulletin completes the report of inspection of fertilizers in New Jersey during 1913, giving analyses and valuations of fertilizers in addition to those reported in Bulletin 259 (E. S. R., 30, p. 327) and discussing the results of the inspection as a whole.

During the year 122 manufacturers and jobbers registered 2,078 brands of fertilizers for sale in the State, 1,617 being mixed goods and 461 fertilizer materials. Of the samples collected 944 were analyzed. Of the 623 brands of mixed fertilizers examined 457 were found to be as guaranteed. Considering the shipments of fertilizers as a whole, the full amount of plant food guaranteed was delivered, but a study of the individual analyses shows that this average was due to a balancing of excesses and deficiencies.

The average composition, valuation, and selling price of the fertilizers examined during the year were as follows: Total nitrogen, 2.63 per cent; total phosphoric acid, 9.28; available phosphoric acid, 7.74; insoluble phosphoric acid, 1.54; potash, 7.13; station's valuation, $23.22; and selling price, $29.37.

According to the certified statements which the law requires manufacturers to make on April 1 and November 1 of each year, the amount of fertilizers sold in the State during 1913 was 156,661 tons, valued at about $4,500,000.

Fertilizer registrations, C. S. CATHCART (*New Jersey Stas. Bul. 264 (1914), pp. 3–45*).—This is a list, accompanied by guarantied minimum analyses, of mixed fertilizers and fertilizing materials which are to be offered for sale in New Jersey during the year ending October 31, 1914.

[Fertilizer inspection in North Carolina 1912 to 1913], B. W. KILGORE ET AL. (*N. C. Dept. Agr. Bul., 34 (1913), No. 10, pp. 198*).—Analyses and valuations of samples of fertilizers (and cotton-seed meal) collected during the fall of 1912 and the spring of 1913 are reported. A list of brands registered, with their guarantied analyses, is also given. It is stated that the fertilizers and meals were found to be generally what was claimed for them.

AGRICULTURAL BOTANY.

Agricultural bacteriology, C. M. HUTCHINSON (*Ann. Rpt. Bd. Sci. Advice India, 1911–12, pp. 128–131*).—A report is made on the work of the bacteriological section, in which the author states that the method of determining the bacteriological activity of the soil by plate counts has been abandoned in favor of methods depending upon the measurement of the physiological activity of the soil organisms.

As a result of his studies it has been ascertained that the rate of formation of carbon dioxid in the soil is directly proportional to the biological activity of that soil. It is also learned that temperature plays an important part in deciding whether ammonification will proceed at such a rate as to allow concurrent nitrification. Some experiments were conducted which demonstrated that where intense bacterial action is taking place in soil any nitrates present may be reduced without the occurrence of anaerobic conditions, and it is probable that the nitrate is utilized as a source of nitrogen by bacteria. In another series of experiments it was determined that in puddled soil the anaerobic conditions prevailing prevented the formation of nitrate, confirming the conclusions of others that the rice plant obtains its nitrogen in the form of ammonia and that the use of nitrate of soda as a rice fertilizer results in a loss of nitrogen through denitrification.

Some brief notes are given on a bacterial disease of tobacco due to *Bacillus solanacearum*, and a bacterial disease of wheat which was found to be attacked by a bacillus closely resembling *Pseudomonas hyacinthi*.

On the fungi of the soil, II, Elizabeth Dale (*Ann. Mycol., 12 (1914), No. 1, pp. 33–62, pls. 5*).—In continuance of previous work (E. S. R., 28, p. 524), the author reports her studies on the fungus flora of three other samples of soil, namely, chalk, uncultivated mountain peat, and black earth of reclaimed fenland. These gave respectively 29, 20, and 18 species, representing respectively 16, 13, and 13 genera, a few species and several genera being found in two or more of the soils examined. None is known to be new.

Bacteria and soil fertility, P. E. Brown (*Iowa Sta. Circ. 7 (1913), pp. 16, figs. 9*).—This is a popular discussion of bacteria, and some of their functions in soils are described.

The mycorrhizas of forest trees, W. B. McDougall (*Amer. Jour. Bot., 1 (1914), No. 2, pp. 51–74, pls. 4, fig. 1*).—This is a detailed account of a previous paper (E. S. R., 30, p. 132).

In the present report the author describes six forms of ectotrophic mycorrhizas and adds four species to the known list of fungi which form ectotrophic mycorrhizas. These are *Russula* sp., *Boletus scaber fuscus*, *Cortinarius* sp., and *Scleroderma vulgare*. It is said that at least four and probably more species of mushrooms may form mycorrhizas on the same tree.

Infection for the formation of ectotrophic mycorrhizas is said to take place by a fungus penetrating the outer portion of the epidermal wall of the root and then branching and spreading in all directions. As soon as a complete mantle of mycelium is formed over the root, any further length of growth is inhibited. On this account the root is stimulated to form branches which in turn are soon infected. The fruiting bodies of an ectotrophic fungus are usually produced soon after the mycorrhiza is formed. Both ectotrophic and endotrophic mycorrhizas are normally annual. They are formed during the summer, reach their fullest development late in the autumn, persist throughout the winter, and die in the spring.

The roots of maple are infected through root hairs in the production of endotrophic mycorrhizas. The mycorrhizas of maples are said to be sometimes in symbiotic association and at other times the fungus can only be considered as an internal parasite of the roots. The ectotrophic mycorrhizas, on the other hand, are not in any sense symbiotic associations, but are considered as parasites on the roots of the trees.

The relation of living chlorophyll to light, D. Iwanowski (*Ber. Deut. Bot. Gesell., 31 (1914), No. 10, pp. 600–612, fig. 1*).—Detailing studies carried out by himself with foliage differing as to thickness, as to area (as related to vol-

ume), and as to coloration in exposure to light, the author concludes that the surprising stability of living chlorophyll is comprehensible only on the hypothesis of a colloidal condition of that pigment.

Investigations on the pigments in chromoleucites. V. LUBIMENKO (*Compt. Rend. Acad. Sci. [Paris], 158 (1914), No. 7, pp. 510–513*).—After calling attention to the change in chlorophyll in the pericarp of fruits, etc., which results in the accumulation of yellow and red pigments in the chloroleucites, the author gives an account of investigations as to the nature of the pigments which thus replace chlorophyll. Oxygen is found necessary for the formation of these pigments and while it is thought that there are probably a considerable number of pigments which replace chlorophyll, they are all connected with lycopin and rhodoxanthin, which are isomeric with carotin and xanthophyll.

The rôle of yellow pigment in chloroplasts. D. IWANOWSKI (*Ber. Deut. Bot. Gesell., 31 (1914), No. 10, pp. 613–617*).—Discussing the decomposing effects of light on chlorophyll in solution, the author states that an increase in the proportion of yellow pigment in alcoholic solutions is accompanied by an augmentation of stability in the chlorophyll content. From this he infers a protective influence of the yellow pigment on the chlorophyll.

Studies on the chemical process of anthocyanin pigment formation. R. COMBES (*Ber. Deut. Bot. Gesell., 31 (1914), No. 10, pp. 570–578*).—The author, continuing to report on recent studies (E. S. R., 31, p. 35), summarizes substantially as follows:

In certain cells of *Ampelopsis hederacea* green growing cells showed a yellowish brown substance very closely related to the anthocyanin pigment of red leaves of the same plant and apparently transformable into that pigment by reduction, a change which normally occurs on the checking of leaf growth in autumn.

The experimental production of anthocyanin outside the leaf may, it is claimed, be regarded as an accomplished fact, and leaf reddening may now be considered as a process not of oxidation, but of reduction. The author expects to present in a later communication some new evidence in this connection and a new theory of leaf coloration based upon results of recent studies.

Some conditions of formation and decomposition of starch. H. LUNDEGÅRDH (*Jahrb. Wiss. Bot. [Pringsheim], 53 (1914), No. 3, pp. 421–463*).—The author gives somewhat detailed results of studies made on transformation relations observable under various conditions in seeds or shoots of plants representing a number of divergent groups, stating in conclusion that while few entirely new facts have been brought out, it is safe to conclude that the simple transformations starch $\rightleftarrows$ sugar and starch $\rightleftarrows$ oil can not be completely explained by the ordinary conception of reversibility.

Physiology of latex in some rubber plants. F. TOBLER (*Ber. Deut. Bot. Gesell., 31 (1914), No. 10, pp. 617–620*).—A study of *Mascarenhasia elastica* showed that the sap from tapped trees was richer in caoutchouc in damp weather, in leaves exposed to light, in young leaves, and in plants having insufficient nitrogenous materials in their food supply. Sprouts arising at points of injury to the trunk developed a greater degree of milkiness in the sap than did the main stem.

In case of *Manihot glaziovii* a definite cycle of change in composition of the sap exuded after tapping was noted. The caoutchouc content of growing parts increased to a maximum near the point of most active growth. Partial girdling was followed by thickening of sap in neighboring vessels in association with an increase of bacteria therein.

All plants having milky latex except *M. elastica* were shown to be subject to attack by snails, this result tending to invalidate the claim that the presence of milky sap or caoutchouc in the leaves is protective against these animals.

The microchemical recognition and the distribution of aluminum in plants, E. KRATZMANN (*Sitzber. K. Akad. Wiss.* [*Vienna*], *Math. Naturw. Kl.*, *122* (*1913*), *II, No. 2, pp. 311–336, figs. 6; abs. in Rev. Sci.* [*Paris*], *52* (*1914*), *I, No. 12, pp. 369, 370*).—The author has made a study of the occurrence of aluminum in plant tissues by microchemical methods based upon the formation of the double sulphate of cæsium and aluminum. He examined several hundred plants representing many families and found that aluminum is present quite extensively in the plant kingdom, certain species being extremely rich in that substance. There did not appear to be any connection between the aluminum content of the plant and the botanical relationship of the species, for notable variations were noticed in different specimens of the same genus and species. In certain cryptogams aluminum was found concentrated in the foliar lobes carrying the spore bearing organs, and the content in flowers was found in some instances greater than that in other parts of the plant.

Some effects of colloidal metals on Spirogyra, W. D. HOYT (*Bot. Gaz., 57* (*1914*), *No. 3, pp. 193–212, figs. 4*).—From the author's account of studies as detailed, it may be stated that colloidal silver, though injurious to Spirogyra when used alone even in weak concentrations, was rendered less so by addition of colloidal platinum, animal charcoal, or inorganic salts. Colloidal gold with sodium hydrate was only slightly injurious. Colloidal platinum, almost harmless itself, partially corrected the toxicity of tap water, distilled water, and solutions of potassium chlorid, magnesium sulphate, and colloidal silver. Toxic solutions of sodium hydrate were rendered less so by colloidal gold, platinum, and silver, but not by gold chlorid.

Filaments of Spirogyra, originally from the same culture but grown for a time in different media, exhibited different reactions in the solutions of colloidal gold and sodium hydrate as well as in the other toxic solutions employed.

A bibliography is appended.

Influence of radio-activity on plants, L. MALPEAUX (*Vie Agr. et Rurale, 3* (*1914*), *No. 11, pp. 289–293, figs. 3*).—A report is given of the effect of a fertilizer material that is claimed to have radio-active properties on the growth of rye grass, oats, turnips, sugar beets, fodder beets, and potatoes, comparisons being made with the same plants grown with and without complete fertilizers. The plants subjected to the radio-active substance appeared to be stimulated to some extent and were darker green in color, but the yields were but little if any greater than where a complete fertilizer was used. In case of the root crops, there was apparently some increase in the sugar content, which it was thought could be attributed to the radio-active substance.

Penetrative power of violet and ultraviolet rays in regard to leaves, P. A. DANGEARD (*Compt. Rend. Acad. Sci.* [*Paris*], *158* (*1914*), *No. 5, pp. 369, 370*).—Reporting a study on the penetrability of foliage of several species of plants, the author shows that the various species can be arranged in classes differing in this respect, some being much more readily penetrable by the shorter wave lengths than is glass of corresponding thickness. It is thought that the facts observed may furnish a new point of departure for a study of the nature and cause of differences occurring in leaves.

Axial abscission in Impatiens sultani as the result of traumatic stimuli, R. A. GORTNER and J. A. HARRIS (*Amer. Jour. Bot., 1* (*1914*), *No. 1, pp. 48–50*).—The authors describe an abscission in *I. sultani* as the result of injury due to greenhouse pests, the removal from a shaded room and transplanting out of

doors, cutting across the stems in the internodes, etc. In nearly every instance the stem was cut off at the next or some lower node by the formation of an absciss-layer.

The survival of plant tissues after freezing, W. RUSSELL (*Compt. Rend. Acad. Sci.* [*Paris*], *158* (*1914*), *No. 7, pp. 508–510*).—In a study of the effect of freezing on a number of plants, the author found that while after thawing the plants might show a wilted condition the ultimate death of the plant might be delayed for several days and even weeks. He claims that where thickened secondary tissues were present among thin-walled parenchyma cells the former were very slow in showing the effect of freezing. He concludes that the death of a plant from freezing is rarely immediate, but that it is delayed in proportion to the uninjured elements, the destruction proceeding with more or less rapidity from cell to cell.

The frost problem up to date, C. FRAZER (*Country Gent., 79* (*1914*), *No. 8, pp. 360, 392, fig. 1*).—This is a brief statement of two recent theories of frost injury to fruit, and of selected results of experiments and observations supporting the conclusion that both the duration of the frozen state and the rate of defrosting are important in determining the effect of cold on the fruit. It is held that even if orchard heating has been delayed until after a freezing temperature has been reached, there may be time to save the fruit. Tabular results of studies on resistance of various fruits at different stages are quoted.

Can selection improve the quality of a pure strain of plants? C. and A. HAGEDOORN (*Jour. Bd. Agr.* [*London*], *20* (*1914*), *No. 10, pp. 857–860, pl. 1*).—As bearing upon the common belief that unselected seed automatically deteriorates, the author cites the results of selective breeding of wheat carried on by L. de Vilmorin and descendants since about 1850, showing reproductions of photographs of a dozen specimen ears of the present generation side by side with those of the original parents. The long-continued selection has produced no apparent change, thus supporting experimentally the statement that in a strain once pure of a self-fertilized plant, no amount of selection can produce amelioration or deterioration, as is possible with habitually cross-fertilized plants.

Coloration of the seed coat of cowpeas, A. MANN (*U. S. Dept. Agr., Jour. Agr. Research, 2* (*1914*), *No. 1, pp. 33–56, pl. 1, figs. 2*).—This is a detailed account of an investigation previously noted (E. S. R., 27, p. 632), in which a study was made of the seed coats of various cultivated cowpeas to determine whether the diversity in the color scheme and kinds of pigments in the seeds have a direct bearing on the problem of heredity.

On the appearance of sterile "dwarfs" in Humulus lupulus, E. S. SALMON (*Jour. Genetics, 3* (*1914*), *No. 3, pp. 195–200, pls. 2*).—The author reports the occurrence, in a large number of crosses made between similar varieties of hops and various individual male hops, of certain individuals which are characterized by their total or almost total inability to climb and their complete sterility, no flowers being produced.

FIELD CROPS.

A table for estimating the probable significance of statistical constants, R. PEARL and J. R. MINER (*Maine Sta. Bul. 226* (*1914*), *pp. 85–88*).—This paper discusses the significance usually put upon the probable error in any given case by biometric workers and points to errors in such considerations. A table is presented, designed to be useful to statistical workers, which sets forth, for a series of ratios between a statistical deviation and the "probable error" of the error distribution, first, the probability that a deviation as great

as or greater than the given one will occur and, second, the odds against the occurrence of such deviations.

Note on the accuracy of bushel weight determinations, C. W. BARBER (*Maine Sta. Bul. 226 (1914), pp. 69–75, figs. 2*).—After testing the accuracy of different methods of filling the bucket of the ordinary grain tester the author gives data to show that with oats the one wherein the grain was poured into the bucket and settled by shaking five times gave more accurate results than filling by dipping and with and without settling. It is noted that "this method, in comparison with that involving no settling of the grain, lowers the standard deviation 38.5 per cent and the coefficient of variation 44.9 per cent."

It was found that the standard grain tester gave results of a high degree of accuracy.

Note on the influence of shape and size of plats in tests of varieties of grain, C. W. BARBER (*Maine Sta. Bul. 226 (1914), pp. 76–84*).—In this paper the author discusses the significance of heavy and light seeding, of the length of the periphery of different sized and shaped plats, of the relation of an area 6 in. wide within the border of a plat to the total area of the plat, and of the relation of marginal drill length to total drill lengh in different shaped plats in the calculations of comparative yields in variety tests.

Data and computations are presented in support of the conclusions that "of rectangular plats of a unit area a square has the shortest periphery and accordingly presents the smallest number of plants along the borders. Therefore a square plat is a more accurate basis for the determination of the value of varieties than any other rectangular shaped plat of equal area. It is clear that in a long narrow plat more plants will be subjected to the conditions afforded by the pathways than in a square of the same area. Also, in small plats proportionately more plants will stand along the border than in large plats."

Deep plowing and subsoiling, A. H. WRIGHT (*Oklahoma Sta. Circ. 26 (1914), pp. 8*).—This circular reports results in subsoil plowing for 10 years with corn, cotton, and oats on a medium upland soil, described as physically a silt loam. It is concluded that subsoiling was not advisable as a farm practice, as neither soil moisture nor crop yield were increased thereby.

The improvement of plants, L. BLARINGHEM (*Le Perfectionnement des Plantes. Paris, 1913, pp. XII+13–192, figs. 30*).—This work contains 7 chapters, discussing plant collections and botanical gardens, polymorphism of cultivated plants, pure lines and pedigrees, crossing of species, crossing of varieties, hybrid mutations and selection, with a bibliography on each topic.

The breeding of forage grasses, H. LANG (*Jahresber. Ver. Angew. Bot., 10 (1912), pp. 1–17, figs. 2*).—This article reviews recent work in the breeding of grasses, describes modern methods, and gives plans for breeding plats.

The history of the cultivated cereals, I, A. SCHULZ (*Die Geschichte der kultivierten Getreide, I. Halle, 1913, pp. 134*).—This book gives the histories of wheat, rye, barley, and oats as derived from the most authoritative literature on the subject. Bibliographies are found at the end of each chapter.

Some further observations on the culture of legumes with special reference to nitrogen assimilation, B. HEINZE (*Jahresber. Ver. Angew. Bot., 10 (1912), pp. 75–114*).—Continuing previous work (E. S. R., 20, p. 740; 24, p. 430), the author reviews certain literature on this subject and discusses some phases of inoculation with pure cultures and with soil in different soil types with lupines and serradella, and in rotation with other legumes.

The inoculation of legumes, P. E. BROWN (*Iowa Sta. Circ. 8 (1913), pp. 3–14, figs. 5*).—This circular describes the soil transfer and pure culture methods of inoculations and discusses their efficiency in field practice.

Influence of soil volume and available plant food on the ratio between root development and yield of cereals, H. BURMESTER (*Jour. Landw., 61 (1913), No. 2, pp. 135–152*).—The results of 2 years' experiments with wheat, rye, oats, and barley grown in pots of different sizes showed that the soil volume at the disposal of the plants had very little influence either on the absolute weight of the roots or upon the ratio between the root and the above-ground part in mature plants.

It was found by reducing the amount of available plant food in the pots that the growth of the above-ground part was curtailed much more severely than was the root system, thus producing a narrower ratio between the parts than when an optimum amount of food was available. It is noted, therefore, that on poor grades of soil the above-ground part does not develop in proportion to the richness of the soil, for the root development robs it in direct ratio to the poverty of the soil.

Leguminous crops in North Carolina, T. B. PARKER (*Bul. N. C. Dept. Agr., 34 (1913), No. 7, pp. 54, figs. 36*).—This bulletin gives notes on the soil treatment for legumes and methods of cultivation of red, mammoth, crimson, bur, sweet, and Lespedeza clovers, alfalfa, vetches, cowpeas, soy beans, and velvet beans.

Some examples of the potash requirements of legumes, CLAUSEN (*Illus. Landw. Ztg., 33 (1913), No. 100, pp. 910, 911, figs. 4*).—Results of several experiments are given in which small yields were obtained with limited or no applications of potash in the presence of otherwise complete fertilizers. With deficient applications of certain fertilizers, the yields of red clover were as follows: With complete fertilizer 3,839 kg. per hectare (about 3,419 lbs. per acre) of dried hay, without nitrogen 3,970, without phosphoric acid 3,017, without potash 2,360, and unfertilized 1,397 kg.

Plants for the desert, H. SEMLER (*Bol. Min. Agr., Indus. e Com. [Brazil], 2 (1913), No. 4, pp. 71–96*).—This article includes notes on about 30 kinds of cultivated plants found in arid and semiarid districts, with a list of seedsmen in several countries that handle such plants and their seeds or cuttings.

Desert plants of Mexico, I. OCHOTERENA (*Mem. y Rev. Soc. Cient. "Antonio Alzate," 33 (1913), No. 1–8, pp. 93–113, pls. 15*).—This article discusses the composition, structure, and classification of the agaves and yuccas found in Durango.

Field experiments, C. D. WOODS (*Maine Sta. Bul. 224 (1914), pp. 25–46*).—The results of 3 years' experiments at Highmoor farm indicated that little was gained by the addition of Thomas slag as a top dressing for grass lands other than maintaining the fertility of the soil.

In regard to methods of planting potatoes it is noted that "in the 3 years' experiments comparing the usual method practiced in Aroostook County with deeper planted seed and a lower, broader ridge than is commonly used there showed that so far as yield was concerned there is nothing to choose in that locality between the two methods. The deep planted and medium planted gave practically the same yields at Highmoor farm with the advantage (though within experimental error) in favor of the medium planted. The medium planted and medium ridge gave considerably better yields at Highmoor farm than the shallow planted and high ridge. The medium ridge is cultivated as cheaply as the shallow ridge and is harvested nearly as easily. The deep planted are cultivated at less cost than either of the two other methods but are far more difficult to harvest. The results indicate that for Aroostook County the shallow planted high ridge is well suited to the climatic conditions. And they also clearly indicate that for the lower counties in the State with

their lesser rainfall during the growing season the medium planted with the broad low ridge cultivation is preferably to either of the others."

From some results of soy-bean experiments the author concludes that "soy beans can be grown in parts of Maine where corn thrives. Where early corn matures, the early white soy bean will usually mature. Where Sanford corn ears, the early medium soy bean will form pods. . . .

"It is doubtful if it would be profitable to grow soy beans for seed in Maine. The varieties that will ripen seed in this climate make small vine growth. The crop is best adapted for feeding green or for silage. . . . A yield of 8 tons of green crop is an average in average seasons on average soil."

Directions are given for the use of iron sulphate as a spray to destroy wild mustard and related plants in fields of sown cereals. Further, "the experience indicates that with a field of potatoes badly infested with mustard spraying with sulphate of iron solution may be resorted to with a reasonable expectation that the yield of tubers will not be diminished. At present such a treatment can only be recommended as a rather extreme measure."

Report of the work done by the agricultural experimental station in St. Croix during the year [ended June 30, 1912] (*Rpt. Agr. Expt. Sta. St. Croix, 1911–12, pp. 61, pls. 8, figs. 10*).—This is a report of progress on the work of this station which was recently established. Results of variety tests with sugar cane, cotton, maize, and sorghum, and soil analyses are reported, with meteorological observations.

Field experiments and demonstrations (*North of Scot. Col. Agr. Leaflets, 1912, pp. VI+166, figs. 2*).—This gives results of variety and manurial tests with cereals, turnips, carrots, sugar beets, mangels, potatoes, alfalfa, grass, and weeds during 1912 in 10 county districts of Scotland.

[Field crop experiments], F. Smith (*Ann. Rpt. Chinsurah Agr. Sta. [India], 1912, pp. 4–10*).—This reports manurial and variety tests with rice, hemp, soy beans, sugar cane, flax, wheat, mustard, lentils, etc.

Alfalfa seed production; pollination studies, C. V. Piper, M. W. Evans, R. McKee, and W. J. Morse (*U. S. Dept. Agr. Bul. 75 (1914), pp. 32, fig. 1*).—Earlier investigations along this line are reviewed. The structure of the alfalfa flower is described and the relation of tripping to the development of the seed.

The results of these studies of pollination of alfalfa flowers brought out the following conclusions: "Alfalfa flowers remain fully susceptible to pollination from the time of opening until the petals wither. Pollination is ordinarily effected when the elastic stamineal column has become 'tripped.' No evidence was found to favor Burkill's theory that tripping effects the rupture of the stigmatic cells and that this is an important factor in fertilization. Flowers tripped in various ways to prevent any stimulation or rupturing of the stigma by contact set pods equally as well as those tripped naturally.

"Flowers tripped artificially, and therefore self-pollinated, set pods freely. In one series of experiments on 77 plants at 7 different places, 9,074 flowers set 2,784 pods when artificially tripped (a percentage of 30.68), while 8,939 flowers on the same plants exposed to natural conditions set 1,499 pods (16.76 per cent). The pods from artificially tripped flowers contained an average of 1.72 seeds each, while those from naturally tripped flowers averaged 2.22 seeds each.

"Pollination from a different flower on the same plant is no more effective than self-pollination, but pollen from another plant increases both the proportion of pods set and the number of seeds per pod. It makes but little difference whether the pollen parent be the same or a different variety. . . .

"There is a wide range of variability in alfalfa plants as regards the readiness with which the flowers become tripped, either automatically or by the

aid of external objects, and also in their ability to set fruit when tripped. The number of pods set is not proportional to the number of flowers, as a smaller proportion of pods is produced on many-flowered racemes than on few-flowered racemes.

"Automatic tripping takes place most frequently in hot sunshine. Humidity is doubtless also a factor. Automatic tripping can readily be observed by focusing a burning glass on open flowers or by simply bringing shaded flowers into the sunshine on a hot day.

"Insects are the natural agents of cross-pollination in alfalfa, but even where they are scarce, good crops of seed may be produced. Bumblebees and leaf-cutting bees (Megachile) are the most efficient insects to trip alfalfa flowers. Honeybees secure much honey from alfalfa flowers, but trip only a very small percentage of the blossoms. Night-flying insects are of negligible value. Butterflies have never been observed to trip a flower during the course of these studies. Rain or wind causes but few alfalfa flowers to become tripped.

"Automatic tripping with consequent self-pollination probably results in the setting of as many pods as does tripping by insect visitors, at least in the West. This conclusion is also in accord with the observation that excellent seed crops are produced in sections where bumblebees and other insects capable of tripping alfalfa flowers are decidedly scarce."

Barley culture in Wisconsin, R. A. Moore and A. L. Stone (*Wisconsin Sta. Bul. 212 (1914), rev. ed., pp. 20, figs. 9*).—This revision (E. S. R., 25, p. 531) contains additional data, together with a score card and directions for scoring barley.

The average yield of pedigree barley for 6 years as produced by members of the Wisconsin Experiment Association is given as 34 bu. per acre as against 29.3 bu. with other varieties. Pedigree barley at the station yielded an average of 44.8 bu. per acre for the 5 years, 1908–1912, while common barley grown by Wisconsin farmers averaged for the same period 27.7 bu.

Cactus opuntia as a forage crop for arid regions (*Bol. Min. Agr., Indus. e Com. [Brazil], 2 (1913), No. 4, pp. 141–150*).—This gives notes on the cultivation and uses of this crop.

Chilian clover, J. W. Hadfield (*Agr. Gaz. N. S. Wales, 24 (1913), No. 10, pp. 857–859, pl. 1, figs. 3*).—This notes the trial of Chilian clover, *Trifolium pratense perenne*, which thrived at the Hawkesbury Agricultural College, whereas all the other varieties of clover practically failed.

Studies in variation of red clover, Edna C. Pammel and Clarissa Clark (*Proc. Iowa Acad. Sci., 18 (1911), pp. 47–53, pls. 4*).—This paper presents data obtained in a study of variation in the number of flowers in heads, variation in length of flowers (stamen tubes), and size of pollen grains for first, second, and third crops grown on black loam, black loam underlaid with gravel, and alluvial soils.

It is noted that "the second crop clover has more flowers in the head than the first crop clover, and that black loam underlaid with gravel is the best soil for the production of red clover." The range extended from 53 to 142 flowers per head, with a mean of 90.44. The length was found to vary from 0.6 to 1 cm. The width of pollen grains varied from 20 to 40 μ, and the length from 28 to 68 μ.

Pollination of clover, L. H. Pammel and Charlotte M. King (*Proc. Iowa Acad. Sci., 18 (1911), pp. 35–45, figs. 3*).—This paper describes the structure of the flower of red clover and data upon the visit of insects to flowers as observed for various periods on different areas. In 814 seconds 381 visits were recorded. That clover is not self-fertilized was indicated in the thrashing of

over 600 heads that had been covered and in which no seeds were found. It is noted that the second crop exceeded the first in the number of seeds per head.

The inheritance of recurring somatic variation in variegated ears of maize, R. A. EMERSON (*Nebraska Sta. Research Bul. 4 (1914), pp. 5–35, figs. 3; Amer. Nat., 48 (1914), No. 566, pp. 87–115, figs. 3*).—In studying the inheritance of variegation in a variety of maize, known as "calico" corn, the author has reached the following conclusions:

"A somatic variation in maize is shown to be inherited in simple Mendelian fashion. The variation has to do with the development of a dark red pigment (or in one stock a brown pigment) in the pericarp of the grains, often associated with the development of an apparently similar pigment in the cob and husks.

"Plants in which this pigment has a variegated pattern may show any amount of red pericarp, including wholly self-red ears, large or small patches of self-red grains, scattered self-red grains, grains with a simple stripe of red covering from perhaps nine-tenths to one-tenth of the surface, grains with several prominent stripes and those with a single minute streak, ears with most of the grains prominently striped and ears that are noncolored except for a single partly colored grain, and probably also plants with wholly self-red and others with wholly colorless ears.

"It is shown that the amount of pigment developed in the pericarp of variegated seeds bears a definite relation to the development of color in the progeny of such seeds. This relation is not such that seeds showing say nine-tenths, one-half, or one-tenth red will produce or even tend to produce plants whose ears as a whole or whose individual grains are, respectively, nine-tenths, one-half, or one-tenth red. Experimental results indicate rather that the more color in the pericarp of the seeds planted the more likely are they to produce plants with wholly self-red ears, and correspondingly, the less likely to yield plants with variegated ears.

"Self-red ears thus produced are shown to behave in inheritance just as if they were hybrids between self-red and variegated races or between self-red and non-red races, the behavior in any given case depending upon whether the parent variegated ears were homozygous or heterozygous for variegated pericarp and whether they were self-pollinated or crossed with white.

"It is suggested that these results may be interpreted by the assumption that a genetic factor for variegation, *V*, is changed to a self-color factor, *S*, in a somatic cell. All pericarp cells directly descended from this modified cell will, it is assumed, develop color, and of the gametes arising from such modified cells one-half will carry the *S* factor and one-half the *V* factor if only one of the two *V* factors of the somatic cells is changed, or all such gametes will carry *S* if both *V* factors are changed. The *V* factor is thought of as a sort of temporary, recessive inhibitor that sooner or later permanently loses its power to inhibit color development, becoming thereby an *S* factor. Or it may be that the dominant factor, *S*, is temporarily inactive, but sooner or later becomes permanently active. Again, the *S* factor may repeatedly arise de novo. The cause of any such change in factors is beyond intelligent discussion at present.

"The results of Correns with Mirabilis and of de Vries with Antirrhinum are shown to be subject to the same analysis as that used to interpret the results secured with maize."

Maize variety trial, 1912, J. G. MCMILLAN (*Agr. Gaz. N. S. Wales, 24 (1913), No. 12, pp. 1061, 1062*).—In a test of 12 varieties of maize from the United States the yields ranged from 30.75 to 58.64 bu. per acre.

Cotton experiments, 1913, R. J. RICKS, E. B. FERRIS, C. T. AMES, and G. B. WALKER (*Mississippi Sta. Bul. 164 (1914), pp. 3–21*).—In this bulletin are found tables giving temperature and rainfall data for 1913, the results of fertilizer tests and planting distance experiments at the central station, variety and fertilizer tests at the McNeill and Holly Springs substations, and variety tests at the Delta substation.

It is noted that no profitable results have been secured at the central station from the use of potash, which has for the most part been applied in the form of kainit, other than on soils where cotton rusts badly. During 1913 there was rust in practically all of the experimental plats excepts those to which had been applied barnyard manure and kainit. The increased yields from the use of nitrogenous and phosphatic materials have also been small. However, the reverse of this is true on the brown loam and piney woods soils of the State, since these fertilizers give profitable returns when used there. In all of the plats where acid phosphate was used it has been noted that the cotton opened up much earlier in the fall.

The results at the Holly Springs substation showed that "the use of both nitrogen and phosphorus, either alone or in combination, has given very satisfactory results. Phosphorus hastens maturity, and valley land that is slow in maturing a crop can be very greatly benefited by its use. The use of potash, either alone or in combination with other elements, appears to be unnecessary in these soils.

"On thin uplands, the use of an equal mixture of acid phosphate and cottonseed meal, at the rate of 200 to 300 lbs. per acre, gives very satisfactory results, and has done so for the past 8 years. Two hundred lbs. of this mixture has increased the yield of seed cotton in many instances over 500 lbs. per year. On the more fertile soils the quantity of phosphorus may be increased to advantage. After leguminous crops, acid phosphate alone, 200 to 300 lbs. per acre, can be used to profit.

"Where leguminous crops are to be grown (no legume will make satisfactory growth on the thin uplands of this section without the use of about 2 tons of crushed or ground limestone per acre), the use of 300 to 400 lbs. of rock floats under the legume will give good results. Where the rock floats is mixed with manure, or with compost, the phosphorus is made available for plant use."

Recent trials with cotton in Grenada, G. AUCHINLECK (*West Indian Bul., 13 (1913), No. 4, pp. 358–366*).—A brief note is given on some cultural trials and on a bacterial disease that results fatally to cotton.

Cotton production in the German colonies, K. SUPF (*Verhandl. Baumwollbau Kom., Kolon. Wirtschaft. Kom., No. 1 (1913), pp. 3–32, pls. 5*).—This discusses the possibility of growing cotton in German East Africa and notes an attempt by the natives to cultivate it.

Cultivation of kapok to replace that of caoutchouc, O. CANTZLER (*Verhandl. Baumwollbau Kom., Kolon. Wirtschaft. Kom., No. 1 (1913), pp. 52–68*).—This article discusses the possibilities of kapok as a crop in the German Colonies to take the place of caoutchouc, the price of which is reported to be continually decreasing.

Germination of oats, C. BRIOUX (*Vie Agr. et Rurale, 2 (1913), No. 47, pp. 531–533*).—This discusses the results of experiments on the germinative ability of oat seeds when aerated and when partially dried.

Effect of certain artificial manures on the bushel weight of oats (*Dept. Agr. and Tech. Instr. Ireland Jour., 13 (1913), No. 4, pp. 705–707*).—The results give averages of experiments conducted at several centers in Ireland, presented in tabular form, with the following conclusions:

In no instance was the difference between the bushel weights of the grain from any two of the plats very great. In all three series of experiments grain of the highest bushel weight, 37¾ lbs., was obtained from the plats fertilized with 1 cwt. sulphate of ammonia, 3 cwt. superphosphate, and 3 cwt. kainit per acre. There was very little difference between the bushel weights of the samples of grain from the plats manured with complete mixtures containing varying quantities of superphosphate and kainit. The poorest quality grain was obtained from the unmanured plats and that dressed with sulphate of ammonia alone. Of the four nitrogenous manures nitrate of soda has produced the lightest grain each season. The results from calcium cynanamid and nitrate of lime were identical.

The potato question, L. PLANCHON (*Bul. Sci. Pharmacol., 20 (1913), No. 12, pp. 728–737*).—In this paper the author reviews the most important literature on the history, species, and the theory of mutation in *Solanum tuberosum*, *S. maglia*, and *S. commersonii*.

Potato spraying experiments at Rush in 1913, F. C. STEWART (*New York State Sta. Bul. 379 (1914), pp. 3–9*).—During the summer of 1913 an extensive series of potato-spraying experiments was conducted in the vicinity of Rush, N. Y. In each of 66 fields a portion of one row (one-fiftieth acre) was very thoroughly sprayed by hand every two weeks. At digging time the yield of this row was compared with that of an adjacent row which had not received the special spraying. In 47 of the fields no spraying was done by the owner, while in the other 19 fields more or less of such spraying was done.

"In the 47 unsprayed fields the spraying done by the station increased the average yield by 17.76 bu. per acre, or 16.4 per cent; and in the 19 sprayed fields, by 15.04 bu. per acre, or 11.2 per cent. It is believed that the increase obtained was due to the partial control of tipburn which was quite plentiful in some fields, the better control of Colorado potato beetles (not well controlled by the owner in a few cases), and stimulation of the plants. Late blight was entirely absent and early blight and flea beetles scarce. Probably the gain from spraying would have been considerably larger had not the plants been killed prematurely by an early frost."

Thoroughness pays in potato spraying, F. H. HALL (*New York State Sta. Bul. 379, popular ed. (1914), pp. 3, 4*).—A popular edition of the above.

Prickly pear as a forage plant, J. E. MARTINEZ (*Bol. Dir. Gen. Agr. [Mexico], Rev. Agr., 2 (1912), No. 10, pp. 908–912*).—Notes are given on the culture of this plant as a forage crop in the State of Oaxaca.

Preliminary note on the classification of rice in the Central Provinces, R. J. D. GRAHAM (*Mem. Dept. Agr. India, Bot. Ser., 6 (1913), No. 7, pp. 209–229, pls. 5*).—This includes a description of methods of cultivation employed in the Central Provinces, as well as preliminary notes on two schemes of classification of rices based on the agricultural and grain characteristics.

Comparative fertilizer experiments with sulphate of ammonia and nitrate of soda on winter rye in 1912, WEHNERT (*Landw. Wchnbl. Schles. Holst., 64 (1914), No. 2, pp. 26–30*).—With applications of sulphate of ammonia and nitrate of soda to furnish equal amounts of nitrogen, rye yielded at the rate of 461 kg. per hectare with the latter and 633 kg. with the former as the increase over no application of nitrogenous fertilizers and the average of results at 10 centers.

Silver beet: Its use as a forage crop, A. MACPHERSON (*New Zeal. Dept. Agr., Indus., and Com. Bul. 36, n. ser. (1913), pp. 12, figs. 6*).—A note on its cultivation and management as a forage crop of much promise.

Possible economies in sugar production, W. R. DODSON (*La. Planter, 52 (1914), No. 2, pp. 25–27*).—This paper, read before the Louisiana Sugar

Planters' Association at its January, 1914, meeting, discusses the unfavorable conditions confronting the sugar planters.

As remedies that will aid the planters to continue to produce sugar at a profit are discussed the following: Increasing tonnage may lessen the cost of production, and this may be secured by enriching the soil and improving the stand and the methods of tillage. As methods of enriching the soil are suggested the use of crop rotation with legumes, and the plowing under and making silage of the tops. It is noted that over a million tons of cane tops are burned annually in Louisiana.

The production of cattle, hogs, dairy products, truck crops, fruits, grain, and forage crops is discussed as diversifications that may gradually take the place of cane growing to some extent with profit, especially on the small farms.

Sweet potatoes, D. C. MOORING (*Oklahoma Sta. Circ. 25 (1914), pp. 12, figs. 3*).—This circular gives directions for the production of sweet potatoes, covering the subjects of soil, soil preparation, propagation, pulling "slips," setting plants, cultivation, harvesting, and storing, with a description of 10 varieties of sweet potatoes, and directions for the construction of a wooden sweet potato house.

Tobacco breeding, H. LANG (*Jahresber. Ver. Angew. Bot., 10 (1912), pp. 18–30, fig. 1*).—This article reviews recent work in tobacco breeding, describes modern methods used in producing commercial tobacco and tobacco seed, and gives a plan for breeding plats.

Variation in tobacco, H. K. HAYES (*Jour. Heredity, 5 (1914), No. 1, pp. 40–46, figs. 5*).—From experiments conducted at New Haven and Bloomfield, Conn., and Forest Hills, Mass., with a Cuban variety of tobacco the author concludes that "environment is of great importance in any system of tobacco breeding, and quantitative characters and especially quality of cured leaf are in a large measure dependent on this feature. Change of environment, however, does not cause a breaking up of type, and whatever variations occur due to environment appear alike in all plants of a particular type.

"Heredity is the second important factor, and poor types will give unfavorable results even under the best environmental conditions. Any system of tobacco breeding must take both heredity and environment into account. The only known means of producing variability as a source of new types is by crossing. The number of new forms which will appear due to a particular cross will depend on the number of germinal characters by which the parent plants differ."

A genetic analysis of the changes produced by selection in experiments with tobacco, E. M. EAST and H. K. HAYES (*Amer. Nat., 48 (1914), No. 565, pp. 5–48, figs. 9*).—This paper records data collected to throw light on the theory that continued selection of the extreme values of certain quantitative characters in successive self-fertilized generations of a number of strains produces no changes in the mean values of the characters.

From observations of the behavior of the character complex number of leaves of numerous families of hybrid tobacco carried to F_7, the authors believe they have demonstrated by even these few data that either plant or animal populations can reach such a state of constancy by inbreeding that no profitable results can afterwards be obtained by the practical breeder, and that a homozygous condition does occur in a definite proportion of F_2 offspring and can be propagated commercially at once if a sufficient number of families are grown to be relatively certain of including the desired combination.

"As to the problem of theoretical importance, the question of the true constancy of homozygotes generation after generation, we believe it to be fair to conclude that a state so constant is reached that even for the theoretical purposes of experimental genetics it may be assumed as actually constant.

Further experiment and larger numbers may show that selection can always cause a shift in the mean, but will necessarily be a shift so slight that it can be detected only by a long continued experiment and enormous numbers."

It is noted that "mutations may occur. We have shown the origin of one family by a very wide mutation. In this particular case it was not difficult to show that a constitutional change took place in a single germ cell of the mother plant."

Field experiments with wheat, 1912, H. K. CHAPMAN, R. W. MCDIARMID, J. W. SHAW, H. BARTLETT, and H. J. KELLY (*Agr. Gaz. N. S. Wales, 24 (1913), No. 12, pp. 1039–1050*).—This paper reports work in progress on the comparative value of bone dust, superphosphate, rock phosphate, bone charcoal, and Thomas phosphate as wheat fertilizers at the Cowra, Wagga, Bathurst, Glen Innes, and Nyngan experimental farms.

Seed tests made at the station during 1913, M. T. MUNN (*New York State Sta. Bul. 378 (1914), pp. 113–137*).—This bulletin describes the methods employed in making a purity test by "count," and states that "during the year 292 official samples of seed were drawn from dealers' stocks by authorized representatives of the commissioner of agriculture. Analyses of these samples showed 17.5 per cent to be violations of the seed law, i. e., they contained in excess of 3 per cent by count of foul or foreign seed and were not so labeled. Lawn grass and grass seed mixtures were the most frequent violations, with alsike clover, red clover, and redtop grass, respectively, coming next in order. . . .

"From correspondents, 975 seed samples were received during the year, and a practical report covering the quality, noxious weed-seed content, adulterants, and general appearance of each sample was given. These voluntary examinations revealed apparently the same seed-trade conditions as did the seed examinations of the previous year."

Purity of farm seeds in 1913, F. H. HALL (*New York State Sta. Bul. 378, popular ed. (1914), pp. 2–4*).—A popular edition of the above.

Results of seed tests for 1913, F. W. TAYLOR and F. APP (*New Hampshire Sta. Bul. 166 (1913), pp. 18*).—This bulletin gives tabulated results of testing 107 samples of seeds from December 1, 1912, to September 1, 1913, the text of the seed law of New Hampshire, and suggestions regarding sampling and the handling of samples.

Report of seed tests for 1913, J. L. BURGESS (*Bul. N. C. Dept. Agr., 34 (1913), No. 9, pp. 48, figs. 2*).—This bulletin gives the results of testing 732 samples of seeds, lists the weed seeds that commonly occur in certain commercial seeds, and notes the effective working of the North Carolina seed law.

Better seed, F. S. HARRIS (*Utah Sta. Circ. 16 (1914), pp. 47–52*).—The need of seed improvement is pointed out, and some directions are given for growing and storing better seeds on the farm.

Homemade seed corn testers, H. D. HUGHES (*Iowa Sta. Circ. 1 (1912), pp. 4, figs. 2*).—This gives directions for making and using the sawdust box tester and the rag doll tester.

Unlawful Iowa weeds and their extermination, L. H. PAMMEL and CHARLOTTE M. KING (*Iowa Sta. Circ. 5 (1912), pp. 3–18, figs. 15*).—This circular gives part of the text of the Iowa weed law, including penalties, and describes and gives methods of eradication of quack grass, Canada thistle, cocklebur, mustard, milkweed, dock, buckhorn or rib grass, wild parsnip, horse nettle, morning-glory, Indian mallow or butter print, burdock, wild timothy or dropseed grass, squirrel tail or wild barley, foxtail, shoofly, chicory, dodder, and wild carrot.

HORTICULTURE.

Commercial gardening, edited by J. WEATHERS (*London, 1913, vols. 1, pp. XII+239, pls. 17, figs. 179; 2, pp. XII+235, pls. 16, figs. 138; 3, pp. XII+240, pls. 16, figs. 90; 4, pp. XII+244, pls. 17, figs. 124*).—A practical and scientific treatise for market gardeners; fruit, flower, and vegetable growers; nurserymen; etc., prepared by many practical specialists and dealing primarily with conditions in Great Britain.

In volume 1 consideration is given to the general aspects of commercial gardening; the science of plant growing; methods of propagation; the science of the soil; manures and manuring; insect pests; garden friends; fungus diseases; fungicides and insecticides; glasshouse building; and heating apparatus. Volume 2 contains horticultural descriptions and cultural details with reference to hardy and half hardy herbaceous plants, bulbs, and flowers; stove and greenhouse plants and flowers; and ferns. Volume 3 discusses commercial fruit growing in general; fruit growing in Worcestershire, Scotland, and Ireland; diseases of fruit caused by fungi, etc.; and grading and packing fruit. Consideration is then given to the various pip fruits, stone fruits, small fruits, figs, grapes, nuts, and melons with reference to varieties, culture, and care. The concluding sections of this volume discuss garden surveying, leveling, and mensuration; and market garden accounts. Volume 4 deals with trees, shrubs, and woody climbers; conifers and taxads; vegetable growing for market; sweet herbs and small salads; and French gardening or intensive cultivation.

The effect of an increased amount of carbonic acid in the air on green plants, H. FISCHER (*Jahresber. Ver. Angew. Bot., 11 (1913), No. 1, pp. 1–8*).—This paper summarizes the author's investigations, previously noted (E. S. R., 28, p. 837).

Experiments with udo, the new Japanese vegetable, D. FAIRCHILD (*U. S. Dept. Agr. Bul. 84 (1914), pp. 15, figs. 12*).—The author here reports experiments conducted since 1906 with udo (*Aralia cordata*), a Japanese vegetable valued for its blanched shoots. Information is given relative to methods of cultivation, preparing, and cooking. Other phases discussed include early experiments with udo, relatives, varieties, climatic requirements, and diseases of udo.

Udo is said to be adapted to New England, the Atlantic States as far south as the Carolinas, the rainy region of Puget Sound, and the trucking sections of California about Sacramento. Although the plant has not thus far assumed commercial importance it is believed that it is now sufficiently well-known to test out its economic value, as compared with such plants as celery, asparagus, and eggplant.

An apple chimera, W. E. CASTLE (*Jour. Heredity, 5 (1914), No. 5, pp. 200–202, figs. 3*).—The author here illustrates and describes an apple in which Golden Russet and Boston Stripe are combined in the same fruit. In the specimens here illustrated the stem end of the fruit is Golden Russet and the calyx end is Boston Stripe, although it is stated that the reverse of this sometimes occurs. The parent stock of the tree was Boston Stripe on which Golden Russet was grafted. The trees producing these apples bear only a few fruits of this composition. The rest of the crop belongs entirely to one or the other of the two varieties concerned.

Pollination in orchards.—II, The flowering of pears, F. J. CHITTENDEN (*Jour. Roy. Hort. Soc. [London], 39 (1913), No. 2, pp. 366–372*).—In continuation of a previous study relative to the blooming time of apples (E. S. R., 26, p. 440), data are here given showing the varieties of pears growing in the

Wisley Gardens, arranged in order according to the average date of flowering for the period 1908 to 1913.

The author concludes that there is a general regularity in the order of the flowering of pears as with apples. Although deviations from this order may occur each season they are not sufficiently marked to destroy the value of the list as a guide to varieties that should be planted near one another in order to facilitate pollination.

The effects of fertilizers in a cultivated orchard, J. H. GOURLEY (*New Hampshire Sta. Bul. 168 (1914), pp. 3–31, figs. 15*).—In this bulletin the author reviews the more important investigations dealing with the fertilization of apple orchards and gives the results of various culture and fertilizer treatments on a bearing Baldwin apple orchard for a 5-year period. The orchard in question was about 26 years old when the experiment started and had previously been growing in sod and yielding unsatisfactory crops. The hay crop was removed annually. The orchard was divided into some 12 plats, which included the sod-mulch treatment, cultivation the odd year followed by a cover crop and seeded the even year, cultivation the even year followed by a cover crop and seeded the odd year, clean cultivation throughout the season, and cultivation and cover crop with complete fertilizers and with fertilizers containing excesses of phosphorus, nitrogen, and potassium. A portion of the fertilizer plats was also limed. The factors considered in this experiment are yield, growth, and size of fruit.

The results secured for the 5-year period show all methods of treatment to be superior to growing trees in sod. The plat which has been cultivated annually every two weeks until September 1 without using a cover crop has given better yield and growth than cultivation every other year with a cover crop in the alternate year. A good system of culture such as cultivating the orchard every two weeks until midsummer then seeding down with crimson clover, has given practically as good results in yield of fruit and growth of tree as that obtained by the addition of a complete fertilizer or one in which either phosphoric acid, potash, or nitrogen are used in excess in the complete fertilizer. Thus far no cash return has been secured for the fertilizer that has been used in the orchard. Size of fruit has been increased by the use of fertilizers, especially those high in nitrogen and potash, and reports for the year 1913 show that the area and weight of the leaves were increased by the use of fertilizers. Lime had no appreciable effect on any of the factors considered. Color of fruit has not been increased by any combination of fertilizers employed.

Spraying program for orchard and vineyard in South Carolina, A. F. CONRADI and H. W. BARRE (*South Carolina Sta. Circ. 25 (1914), pp. 8*).—This circular contains concise directions for the summer spraying of orchard fruits and grapes, including instructions for preparing spray mixtures.

Analyses for poison of apples sprayed with aresenate of lead in midsummer, C. D. WOODS (*Maine Sta. Bul. 224 (1914), pp. 46–48*).—In connection with some spraying experiments for the control of brown-tail moths in the orchard at Highmoor farm the trees were sprayed with arsenate of lead the first week in August. Analyses were made of the apples at the harvest time to determine whether appreciable quantities of arsenic could be found in the fruit.

The results of the spraying and the analyses indicated that midsummer spraying with lead arsenate is an effective way of combating the brown-tail moth, and that the amount of arsenic or of lead that will remain at harvest upon the apples sprayed in midsummer with arsenate of lead is so slight as to have no practical bearing.

Analyses of materials sold as insecticides and fungicides, C. S. CATHCART, R. L. WILLIS, and W. H. PEARSON (*New Jersey Stas. Bul. 262 (1913), pp. 3–11*).—This bulletin contains analyses of some 50 samples of various materials examined by the station in 1913. They include products sold as Paris green, lead arsenate, Bordeaux and lead arsenate mixtures, Bordeaux mixtures, zinc arsenite, Electro Bordo Pulp, lime-sulphur solutions, and atomic sulphur.

Making a garden of small fruits, F. F. ROCKWELL (*New York, 1914, pp. 56, pls. 8*).—A small practical treatise for the amateur gardener.

Currants and gooseberries, E. F. PALMER (*Ontario Dept. Agr. Bul. 222 (1914), pp. 36, figs. 22*).—This bulletin discusses the extent and importance of the currant and gooseberry industries of Ontario and describes the most approved methods of culture for the home garden and commercial plantation.

Propagation of the seedless breadfruit, P. J. WESTER (*Philippine Agr. Rev. [English Ed.], 7 (1914), No. 3, pp. 97–99, pl. 1, fig. 1*).—A method of propagating the seedless breadfruit by root cuttings is here described. This method, which consists of propagating the cuttings in a bed of sand or sandy loam, has yielded over 75 per cent of healthy plants.

Cacao culture in Samoa, E. DEMANDT (*Tropenpflanzer, Beihefte, 15 (1914), No. 2–3, pp. IX+135–307, figs. 54*).—A practical treatise on the establishment, care, and management of cacao plantations in Samoa, including information relative to insect pests and diseases of cacao, working plans, and cost and yield data.

New researches into some statistics of Coffea, P. C. VAN DER WOLK (*Ztschr. Induktive Abstam. u. Vererbungslehre, 11 (1914), No. 4, pp. 355–359, fig. 1*).—A further report on the author's biometric study of fluctuating variability in leaf length and internodal length in coffee plants (E. S. R., 30, p. 534).

Fruits of a date palm in the tertiary deposits of eastern Texas, E. W. BERRY (*Amer. Jour. Sci., 4. ser., 37 (1914), No. 221, pp. 403–406, figs. 2*).—This comprises a note on the recent discovery of the fossil fruits of a species of date palm in the tertiary deposits of eastern Texas.

The present state of olive growing in Italy, F. BRACCI (*Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1913), No. 10, pp. 1496–1502*).—A brief survey of the olive industry in Italy, including statistics of production and notes of various conditions which have tended to decrease the production during the past 30 years.

Chestnut breeding experience, W. VAN FLEET (*Jour. Heredity, 5 (1914), No. 1, pp. 19–25, figs. 9*).—This comprises a popular account of the author's work in breeding chestnuts during the past 20 years. The native species were used to a considerable extent in the earlier work, but these were later abandoned owing to the advent of the chestnut bark disease in 1907. Selection work was then continued with self- and chance-pollinated individuals of the chinquapin and certain Asiatic types.

Of the hybrids which have been secured, trees having *Castanea americana* in any combination have nearly all disappeared. The crosses of Asiatic and native chestnuts showed a greater blight resistance than crosses of European and native nuts. The chinquapin-European hybrids are readily affected by blight but have great recuperative powers, bearing nuts the second year on suckers springing from the bases of diseased stems. Chinquapin-native crosses are very susceptible as a rule and do not recover readily. The wild chinquapin itself appears measurably resistant. The Asiatic chestnuts and the chinquapin-Asiatic hybrids are plainly highly resistant. Few have shown any appearance of infection and when noticeable the injury is quite local in character. Second generation seedlings of chinquapin-*crenata* crosses show no disease at all though always exposed to infection.

Some of the more promising chinquapin hybrids are illustrated and described.

California gardens, E. O. MURMANN (*Los Angeles, Cal., 1914, pp. 116, figs. 153*).—This work contains some fifty plans for gardens, including all the different types which are popular in this country and abroad. Although designed primarily for California bungalows they are adaptable to any type of house and for various climates with the substitution of suitable plants.

Garden flowers as they grow, H. ESSENHIGH-CORKE and H. H. THOMAS (*London, New York, Toronto, and Melbourne, 1913, pp. 197, pls. 20*).—A popular work containing photographs in color of a number of our more important garden flowers, including descriptive notes dealing with their horticultural characteristics, special requirements, and desirability for planting.

The rose book, H. H. THOMAS ET AL. (*London, New York, Toronto, and Melbourne, 1914, pp. XI+283, pls. 72, figs. 9*).—This work is offered as a complete guide for amateur rose growers. The subject matter is discussed under the following general headings: Roses to begin with, roses to proceed with, some very practical matters, rose growing under glass, round the year in the rose garden, and lists of varieties for various purposes.

FORESTRY.

Silviculture, A. JACQUOT (*Sylviculture. Paris and Nancy, 1913, pp. XIV+243, figs. 8*).—A practical manual on silviculture, prepared with special reference to conditions in France. It is intended as a guide to estate owners, managers of forest domains, reforesters, and students.

Forest protection, H. VON FÜRST (*Die Lehre vom Waldschutz. Berlin, 1912, 7. ver. ed., pp. VIII+190, pls. 5*).—A revised edition of Kauschinger's Lehre vom Waldschutz, the first edition of which appeared in 1846. Forest protection is here considered under three general headings—protection of the forest against inorganic nature, protection against organic nature, and protection against depredations by man.

Forest trees, shrubs, and bushes, C. L. GATIN (*Les Arbres, Arbustes, et Arbrisseaux Forestiers. Paris, 1913, pp. LX+116, pls. 102, figs. 32*).—This is the first volume of a practical encyclopedia for naturalists in preparation by various authors.

Descriptions with illustrations in color are given of about 100 species of the more common forest trees, shrubs, and bushes of Europe. In addition to the botanical characteristics of the species, information is given relative to their distribution with special reference to France, special characteristics, requirements, economic importance, diseases, and insect pests, the birds which nest in them, etc.

Contribution to the knowledge of the oil palm (Elæis guineensis), O. BECCARI (*Agr. Colon. [Italy], 8 (1914), Nos. 1, pp. 5–37, pls. 4; 2, pp. 108–118, pls. 8; 3, pp. 201–212, pls. 3; 4, pp. 255–270, pls. 2, fig. 1*).—This comprises a study of the oil palm varieties of tropical Africa. Introductory considerations deal with the habitat, geographical distribution, economic importance, agricultural requirements, extraction of oil, and reproductive characteristics of the oil palm.

Rubber, its sources, cultivation, and preparation, H. BROWN (*London, 1914, pp. XIII+245, pls. 12, figs. 4*).—This work is offered as an account of the present position of rubber production with special reference to West Africa. Consideration is given to the characteristics and natural distributon of the rubber tree, plantation practices, and the more technical questions connected with the tapping, collection, and preparation of rubber.

Rubber culture.—I, Hevea brasiliensis, H. ZAEPERNICK (*Kautschukkulturen. Berlin, 1914, vol. 1, pp. XV+178, figs. 34*).—This is the first of a series of works dealing with rubber culture, and treats of the plantation culture and exploitation of *Hevea brasiliensis* in various tropical countries. In addition to cultural practice information is given relative to tapping operations, methods of coagulating rubber, and estimates on the cost of producing plantation rubber.

Suitability of longleaf pine for paper pulp, H. E. SURFACE and R. E. COOPER (*U. S. Dept. Agr. Bul. 72 (1914), pp. 26*).—This bulletin reports a series of tests conducted at the U. S. Forest Products Laboratory, Madison, Wis. In order to determine the suitability of southern pines for paper pulps, to ascertain the effects of varying cooking conditions in the sulphate process of pulp making, and to compare the sulphate process with the soda process.

Results thus far secured show conclusively that longleaf pine is well adapted for the manufacture of natural-color kraft pulps and papers, and that the sulphate process of pulp making applied to this wood affords products of better quality and of higher yields than the soda process. Kraft papers can be made from longleaf pine that are equal or superior in quality to the imported and domestic kraft papers now on the market. The high gravity of the wood and the resultant high yield of pulp per cord give longleaf pine an advantage possessed by few, if any other, commercially important woods suited for pulp making.

Uses for chestnut timber killed by the bark disease, J. C. NELLIS (*U. S. Dept. Agr., Farmers' Bul. 582 (1914), pp. 24, figs. 8*).—This bulletin contains information of value to wood-lot owners relative to the utilization of chestnut timber that has been killed by the bark disease. Preliminary strength tests conducted by the Forest Service upon chestnut killed by the bark disease indicate that sound wood from dead trees is fully as strong as wood from healthy trees, providing that the trees have not been injured by insects, decay, or checking. Checking starts in small trees in the second year, and in all trees is rapid from the fifth year on. In order that the timber may be placed on the market before it begins to deteriorate it is advised that diseased chestnut be cut during the first winter after infection.

Rocky Mountain mine timbers, N. DE W. BETTS (*U. S. Dept. Agr. Bul. 77 (1914), pp. 34, figs. 7*).—Bending and crushing tests of a number of kinds of timber used in Colorado for mine beams, props, and caps are reported in tabular form and discussed. Data are also presented as to the consumption and production of mine timbers in Colorado, including production by species, the cost for different sizes, and the life of mine timbers. The methods used in the tests, together with data on individual crushing and bending tests are appended.

The tests included green, air-dried, and fire-killed timber. They indicated that air-dried mine props and caps are much superior to green ones as to strength at the elastic limit, strength at maximum load, and stiffness. With the exception of Douglas fir there seems to be as much variation in the strength of one species procured in different places as among the different species themselves. This is attributed to defects which are usually found in material used for caps and props. The unit strength and stiffness of 16 ft. round beams decreased with an increase in diameter. Beams cut from timber standing dead for about 30 years showed a strength intermediate between green and air-dried material cut from live timber. The tests indicated that timber cut from dead trees can be graded as to decay and defects on the same basis as other material.

Tests of wooden barrels, J. A. NEWLIN (*U. S. Dept. Agr. Bul. 86 (1914), pp. 12, pls. 6*).—The author here reports tests of barrels made from quarter-sawed white oak which were conducted in cooperation with the Bureau for

the Safe Transportation of Dangerous Explosives in order to obtain data upon which specifications and changes in the design of wooden barrels used in the transportation of dangerous liquids might be based.

DISEASES OF PLANTS.

The organization in various countries of the service for the protection of plants, J. M. SAULNIER (*Le Service de Protection des Plantes dans les Divers Pays. Rome: Internat. Inst. Agr., 1914, 2. ed., pp. XIII+305, pl. 1, fig. 1*).—This monograph gives the organization of different countries relating to the study of fungus and insect parasites of plants, rules for inspection, etc., following the general plan previously noted (E. S. R., 26, p. 445).

In addition to the countries reported in the previous edition, there are included in the present monograph Argentina, Austria, Hungary, Brazil, Costa Rica, Egypt, United States, Algeria, New Zealand, Union of South Africa, Greece, Guatemala, Japan, Norway, and Servia.

Problems and progress in plant pathology, L. R. JONES (*Amer. Jour. Bot., 1 (1914), No. 3, pp. 97–111*).—This is an address delivered by the author as the retiring president of the Botanical Society of America, read at the Atlanta meeting December 31, 1913, in which a review is given of recent progress in the investigation of plant diseases, particular attention being paid to American investigations. Some of the problems of disease control are pointed out.

Agricultural bacteriology, special inquiries, C. M. HUTCHINSON (*Ann. Rpt. Bd. Sci. Advice India, 1912–13, pp. 126–128*).—Notes are given on the rice disease due to nematodes, a brief account of which has been noted by Butler (E. S. R., 30, p. 49), an indigo disease which is apparently of bacterial origin, and a potato rot. From rotting tubers two bacteria were found invariably present and the rotting of the tubers took place in the presence of these bacteria wherever the dry tubers had suffered mechanical injury, or where uninjured tubers were kept in a moist condition for a few hours.

Notes on some rusts in India, E. J. BUTLER (*Ann. Mycol., 12 (1914), No. 1, pp. 76–82, figs. 4*).—Descriptions are given of leaf rusts named as follows: *Kuehneola fici* on *Ficus glomerata*, *Colcosporium oldenlandiæ* on *Oldenlandia aspera*, and *Puccinia kühnii* on *Saccharum spontaneum*.

The ascosporic condition of the genus Aschersonia, R. THAXTER (*Bot. Gaz., 57 (1914), No. 4, pp. 308–313, fig. 1*).—The author has made a study of some of the species of entomogenous fungi in Trinidad and describes the ascosporic stage of *A. turbinata*.

The Plasmodiophoraceæ and their relationship to the Mycetozoa and the Chytrideæ, E. J. SCHWARTZ (*Ann. Bot. [London], 28 (1914), No. 110, pp. 227–240, pl. 1*).—As a result of a cytological and life history study of the species of Plasmodiophoraceæ, the author agrees with Maire and Tison (E. S. R., 21, p. 423; 25, p. 43) that the Plasmodiophoraceæ should form a separate order intermediate between the Sporozoaires and Myxomycetes. He also describes three new species of Ligniera as follows: *L. bellidis* on roots of *Bellis perennis*, *L. menthæ* on *Mentha pulegium*, and *L. alismatis* on *Alisma plantago*. All the species of this genus are said to be root parasites and infection takes place near the root tips. They are said not to cause hypertrophy in the host plants and on this account are somewhat difficult of recognition.

A bibliography is appended.

North American Uredineæ, E. W. D. HOLWAY (*Minneapolis, Minn., 1913, vol. 1, pt. 4, pp. 81–95, pls. 8*).—The author describes the species of Puccinia occurring on the Araliaceæ, Umbelliferæ, and Cornaceæ of North America.

Some observations on a peculiar soil disease, W. E. COLLINGE (*Jour. Bd. Agr. [London], 20 (1914), No. 10, pp. 875–879*).—The author reports experiments in treating plats that had shown abnormal conditions and lowered returns during some years of cultivation in wheat, oats, rye, mangolds, and potatoes. Unslaked lime, 12 to 15 cwt. per acre, showed little or no improvement, but with sulphur at from 4 to 6 cwt. per acre there were produced normal or improved crops. The use of 8 cwt. killed many of the plants. Untreated plats showed steady deterioration from year to year.

The author thinks this disease may be due to bacteria which interfere with the nutrition of the plant; but he refers, in this connection, to the contributions of Russell and Hutchison, dealing with the alleged influence of protozoa in the soil (E. S. R., 22, p. 121; 24, p. 621).

Injury by smelter smoke in southeastern Tennessee, G. G. HEDGCOCK (*Jour. Wash. Acad. Sci., 4 (1914), No. 4, pp. 70, 71*).—The author states that the injury to vegetation in this region still extends in the same general direction from the sources of injurious gases as reported by Haywood (E. S. R., 19, p. 222; 23, p. 430), the slightly lower degree of injury corresponding to the observed greater extension in area. Prevailing winds are important or decisive factors as to distance and direction. The injury is most severe with conifers and in upland regions. Garden beans, which are especially susceptible, afford a delicate index as to the direction and distance of extension. The injury, which is attributed mainly to sulphur dioxid, shows characteristic features and the various trees affected show resistance thereto in a definite order, which is set forth.

A study in cereal rusts, physiological races, E. C. STAKMAN (*Minnesota Sta. Bul. 138 (1914), pp. 56, pls. 9*).—The author presents the results of an investigation undertaken with the object of determining the possibility of developing and breaking down physiological races of rusts as well as obtaining information concerning some of the factors influencing varying resistance in immune or semi-immune varieties of wheat.

Inoculation experiments were carried on with *Puccinia graminis hordei*, *P. graminis avenæ*, *P. graminis secalis*, and *P. graminis tritici* obtained from their respective hosts in the fields at the station and cultivated through at least a dozen successive transfer generations. In nearly all of the experiments with biologic forms the rust had been confined to its own host for at least 20 generations. Spores of the rusts were placed on leaves of various varieties of wheat, barley, oats, rye, einkorn, and emmer, after which the conditions were made as favorable as possible for the development of the fungus, either by producing a high moisture condition or the use of anesthetics, excessive fertilization, leaf injury, etc.

It was found that direct transfers of *P. graminis* may be made from oats to wheat and rye. The rusts from oats and barley used in the experiments could be readily transferred to rye. The use of anesthetics had some effect in rendering an immune plant slightly more susceptible to rust, while leaf injury apparently had no effect. High fertilization, by increasing the virulence of the attack on semi-immune forms, is thought to have some influence in breaking down biologic forms. The author found that there was apparently a physiological and probably a slight morphological change in the rust fungus when grown continuously on a semi-immune host, the change manifesting itself, however, very gradually as an adaptation to the new host. It is believed that biologic forms of cereal rusts, at least *P. graminis tritici*, do not lose their specialization tendencies when grown on barberry. The degree of incompatibility of host and parasite was found to vary greatly. In semicompatible forms comparatively

large leaf areas are sometimes killed, indicating a killing of host cells by the fungus and a consequent death of the mycelium itself. In this respect they resemble very closely some of the rust resistant forms of wheat, and this is thought to throw light on the question of the nature of resistance to *P. graminis*.

In the second part of the bulletin the author discusses rust resistant varieties of wheat.

It was found that in making inoculations in the greenhouse on wheats resistant to *P. graminis tritici*, only two, Khapli, an Indian emmer, and Kubanka 2094, possessed a very marked degree of real resistance, although a number of other forms were fairly resistant in the field. It was observed that the more resistant a form proved, the more pronounced was the tendency of the rust to kill small areas of the leaf. The length of incubation period was found to be correlated to some extent with the degree of immunity, those forms being most nearly immune having the longest incubation period. Infection secured on partially resistant varieties as a result of inoculations with æcidiospores and primary uredospores proved only slightly more virulent than did that secured by means of inoculation with long-time uredospores.

Experiments with drought-resistant durum wheats grown in a very dry soil and with Minnesota No. 163 in wet soil indicated that normal conditions for the host plant are probably the most favorable ones for rust development. The presence or absence of excessive amounts of fertilizer elements was not found to directly affect immunity or susceptibility of wheats. The addition of copper sulphate, copper carbonate, and iron sulphate to nutrient media in which plants were grown did not markedly diminish the amount of rust when they were used in such concentration as to permit the normal development of the host plants. A comparison of the sequence of infection in susceptible and immune forms showed that the fungus gained entrance into the host plant in the same manner in both cases, growing readily in the tissues of the susceptible variety, while it does not thrive in the immune forms. The reason for this is believed to be a physiological incompatibility.

A bibliography is appended.

[Grain diseases] (*Edinb. and East of Scot. Col. Agr. Rpt. 30 (1913), pp. 15–19*).—Barley leaf stripe (*Helminthosporium gramineum* and *H. teres*) is said to cause injury only where it is excessively abundant. Early sowing favored attack, whereas late planting hindered it. The removal and destruction of plants attacked by leaf stripe has proved a good method of eradicating the disease. Formalin and copper sulphate treatment of seeds greatly reduced leaf stripe.

[The stem rot of cereals], L. Mangin (*Jour. Agr. Prat., n. ser., 27 (1914), No. 8, pp. 236–239*).—The author recognizes two forms of stem diseases of cereals, one due to Leptosphæria and Ophiobolus, and the other to *Fusarium* spp., among the best known being *F. nivale*. All the species of the fungi attack cereals near the ground, causing a weakening of the stems and often resulting in very considerable losses.

Experiments on control of loose smut of barley and wheat, R. Schander (*Mitt. Kaiser Wilhelms Inst. Landw. Bromberg, 6 (1914), No. 2, pp. 132–139, pl. 1*).—Regarding the plan and principle of control of loose smut as determined by previous investigations (E. S. R., 28, p. 646), the author gives attention to the possibility of simplifying the process, and of reducing injury caused to germination and yield by such treatment.

The work and results are exhibited in tabular form, permitting the inference that the second treatment employing hot water (52 or 53° C.) can not well be dispensed with or shortened from 10 to 5 minutes. Other features are discussed and the work is to be continued.

Bad germination of wheat seed (*Jour. Bd. Agr. [London], 20 (1914), No. 10, pp. 894–896, pl. 1*).—This is a report, with discussion, of the findings in case of wheat submitted for investigation at Kew.

Germination tests gave a percentage of 81, which was increased to 93 by slightly cutting the seeds. This result suggested, and examination demonstrated, the presence of disease. This was ascribed to the fungus *Cladosporium graminum*, which blackened the chaff and shriveled the embroys of the seeds attacked. It is stated that the mycelium dormant in the seeds becomes active under the conditions favorable to germination. In bad cases every portion of the ear is attached. It is often present in the hairs on the chaff and in the bristle-like hairs forming the beard, apparently dissolving the cell wall to some extent, as the threads exceed the original cavities in size. In addition to the persistent mycelium, numerous microsclerotia are formed which act as resting spores, germinating in spring, producing very minute secondary conidia which infect the living plant, and rapidly spreading the disease.

Causes of soil sickness in wheat lands, etc., H. L. Bolley (*North Dakota Sta. Bul. 107 (1913), pp. 96, figs. 45*).—This is a detailed account of the author's investigations, which have led to his theory that diminished yields of wheat in the Northwest are due to fungus attack and not to soil depletion (E. S. R., 25, p. 650). Various phases of the investigations have been previously noted (E. S. R., 28, p. 442; 29, pp. 515, 516). A number of species of Helminthosporium, Fusarium, Colletotrichum, Alternaria, Cephalothecium, and Macrosporium are found associated with wheat sick soils either singly or in various combinations. These fungi have also been found infesting seed, thus providing for the spread of disease to new areas.

The author considers a lack of rotation responsible, in part at least, for the presence of the fungi in the soil, and for controlling the troubles due to soil or seed infestation he recommends the avoidance of mixed varieties of cereals, planting of pure varieties of seed, selection of well cured, plump, heavy seeds, disinfection of seed, and rotation of crops.

Danger in threshing machines (*Country Gent., 79 (1914), No. 6, p. 250*).—Attention has been called by H. T. Güssow to the losses due to dissemination of smut diseases by public service threshing machines. A method of disinfecting the machines with formalin is described, which is claimed to be simple, effective, comparatively inexpensive, and capable of application with little loss of time while traveling from farm to farm.

Finger-and-toe disease of crucifers, P. Berthault (*Jour. Agr. Prat., n. ser., 26 (1913), No. 48, pp. 693–694, figs. 2*).—A distinction is drawn between the forms of injury inflicted upon crucifers by *Plasmodiophora brassicæ* and that due apparently to certain gall producing insects.

Finger-and-toe, G. Fron (*Jour. Agr. Prat., n. ser., 26 (1913), No. 49, pp. 730, 731*).—Referring to the article above noted, the author reports that soil on which cruciferous crops had been severely injured in spots by *Plasmodiophora brassicæ* during the previous year showed serious shortage on the same areas when planted in carrots, though no organism was found in the plants affected.

Finger-and-toe of crucifers, A. Gay (*Jour. Agr. Prat., n. ser., 26 (1913), No. 52, pp. 816, 817*).—The author reports that an examination following the above suggestion by Fron showed that in case of carrots following crucifers nearly every case of poor success of the former crop occurred on spots where the latter crop had previously been affected with *Plasmodiophora brassicæ*. The question is raised whether the presence of certain insects might not prove to be significant in this connection.

Finger-and-toe of crucifers and a disease of carrots, P. Passy (*Jour. Agr. Prat., n. ser., 27 (1914), No. 3, pp. 87, 88*).—Referring to the reports above noted, the author cites a case of spinach decreasing in returns since 1911. *Plasmodiophora brassicæ* had not been known in these plats previously, and no injury to the roots was apparent. The loss is considered due to some cause not yet determined.

Finger-and-toe disease in Brussels sprouts (*Worcester Co. Expt. Gard., Droitwich, Ann. Rpt. 1912; abs. in Jour. Bd. Agr. [London], 20 (1914), No. 11, p. 1010*).—Land that finger-and-toe disease had rendered useless for growing Brussels sprouts before 1903 was subjected for five years to treatment with gas lime, quicklime dug in, or quicklime left on the surface. In 1911 plats receiving the last two treatments yielded 97.82 per cent of clean rooted plants. Apterite and vaporite were tried in place of the gas lime, but without results. A further trial showed that a surface dressing of quicklime gave better results than one of iron sulphate.

Control of black canker of potato, Spieckermann (*Illus. Landw. Ztg., 34 (1914), Nos. 2, pp. 7–9, figs. 3; 3, p. 16, fig. 1*).—In experiments with fungicides against *Chrysophlyctis endobiotica* the best results are claimed from sulphur in soil applications. There was no seriously injurious effect on the growth of the plant.

Phloëm necrosis as cause or symptom of leaf roll, R. Schander and M. Tiesenhausen (*Mitt. Kaiser Wilhelms Inst. Landw. Bromberg, 6 (1914), No. 2, pp. 115–124, figs. 4*).—Referring to views expressed by Quanjer (E. S. R., 29, p. 347), the authors state that their recent investigations, here discussed, only in part confirm the conclusions of that author. They do not regard phloëm necrosis as the cause of leaf roll of potato, but as a secondary phenomenon probably due to some functional disturbance not yet fully understood.

Wart disease of potatoes (*Gard. Chron., 3. ser., 55 (1914), No. 1416, pp. 106, 107*).—The text is given of the order of the British Board of Agriculture and Fisheries known as the wart disease of potatoes (infected areas) order of 1914. It relates to protection against potato canker, due to *Synchytrium endobioticum*, giving definitions, regulations, penalties, etc., with a list of resistant varieties recommended for planting on premises already infected with the disease.

Powdery scab (Spongospora subterranea) of potatoes, I. E. Melhus (*U. S. Dept. Agr. Bul. 82 (1914), pp. 16, pls. 3*).—This is a description of the powdery scab of potatoes, which is well known in Europe, particularly in the British Isles, and which has lately been found present in parts of the United States (E. S. R., 29, pp. 448, 550). A bibliography is appended.

The potato quarantine and the American potato industry, W. A. Orton (*U. S. Dept. Agr. Bul. 81 (1914), pp. 20, fig. 1*).—After describing a number of the more destructive diseases of the potato the author gives the text of orders relating to the regulation of the importation of potatoes and the potato quarantine order. By the latter order the stoppage of potato importations from Canada and all countries of Europe for an indefinite period has been brought about largely on account of the occurrence of the powdery scab (*Spongospora subterranea*). Under certain regulations potatoes will be allowed to enter this country from nonquarantined countries when properly inspected and certified to by officials in the country of origin.

A discussion is given of the potato crop of the United States and of the desirability for utilization of surplus potatoes.

The black rust of Deli tobacco, J. A. Honing (*Bul. Deli Proefstat. Medan, No. 1 (1914), pp. 16, pls. 2*).—This disease, which is called by planters black

rust to distinguish it from another rust that is said to be of nonparasitic nature, is characterized by the occurrence of spots on the leaves, surrounded by a dark green border, indicating the extension of the diseased tissue. Usually the disease appears only in tobacco fields at higher elevations, although in wet seasons it occurs also on the lower estates. The cause of the disease is said to be *Bacterium pseudozoogloæ* n. sp. A technical description of the bacterium is given and its cultural relations are described. The bacterium is said to be not strictly parasitic, but becomes so under special conditions, among which humidity is the most important.

A brief bibliography is appended.

The effect of dust from cement mills on the setting of fruit, P. J. ANDERSON (*Plant World, 17 (1914), No. 3, pp. 57–68*).—This is an account of investigations carried on by the author, a preliminary note of which has appeared elsewhere (E. S. R., 27, p. 152).

Summarizing the results of the investigations, the author states that dust from cement kiln stacks containing a large amount of alkaline, soluble calcium salts was found to settle on vegetation within a radius of 2 miles from the mills. When the dust falls on fruit blossoms some of it goes into solution in the stigmatic secretions and pollen falling on the stigma will not germinate and the flowers are not fertilized. Artificial tests show that pollen will not germinate in even very weak solutions of the dust. When blossoms of apple and other fruits were dusted as fast as they opened, only a very small proportion set fruit.

Fruit culture in Normandy, J. PORTER (*Jour. Bd. Agr. [London], 20 (1914), No. 10, pp. 860–865, figs. 2*).—Along with other information the author notes that black scab, the chief fungus pest of pears at the present time, may be prevented by frequent spraying with soda Bordeaux or Burgundy mixture during the year. In winter, however, he finds it cheaper and apparently as effective to use a 7 per cent solution of iron sulphate in place of the soda Bordeaux.

A rust new on apples, pears, and other pome fruits, P. J. O'GARA (*Science, n. ser., 39 (1914), No. 1008, pp. 620, 621*).—A description is given of a rust due to *Æcidium blasdaleanum*, the telial stage of which is said to be *Gymnosporangium blasdaleanum*, parasitic on the incense cedar of the Pacific coast. The disease was first noticed in 1908 and has since been under observation. It is said to occur rather sparingly on apples, but attacks certain varieties of pears very seriously. The rust is not rœstelia-like, as in the case of the common apple rust. Its host plants, so far as known, include apple, crab apple, various pears, mountain ash, quince, serviceberry, and thorn apple.

Experiments with apple leaf spot fungi, J. W. ROBERTS (*U. S. Dept. Agr., Jour. Agr. Research, 2 (1914), No. 1, pp. 57–66, pl. 1*).—A study was made of certain leaf spot fungi to determine whether they were capable of enlarging spots already formed.

In these experiments inoculations were made both in the greenhouse and orchard on unsterilized leaves, by spraying spores on leaves which contained dead spots made by touching them with the heated end of a steel rod. It was found that under certain conditions *Alternaria mali* was able to enlarge the dead spots on the apple leaves, from which it is concluded that this species is a rather strong facultative parasite. *Coniothyrium pirinum* was found to possess but little power of enlarging dead areas and, according to the author, may therefore be classified as a saprophyte or at least as a weak facultative parasite. *Coryneum foliicolum*, *Phyllosticta limitata*, *Monochætia mali*, and *Phomopsis mali* are, so far as the apple leaf is concerned, believed to be purely saprophytic.

A technical description of *A. mali* n. sp. is given.

Spraying experiments and apple diseases in 1913, W. J. MORSE (*Maine Sta. Bul. 223 (1914), pp. 24, pls. 4*).—This bulletin constitutes a fourth report of a series on orchard spraying experiments (E. S. R., 29, p. 145) and gives the results of the experiments and observations of 1913.

Plats of apple trees were sprayed with Bordeaux mixture, various treatments of lime-sulphur solution, soluble sulphur, atomic sulphur, arsenate of lead, and arsenite of zinc used in connection with the lime-sulphur solution. The effect of the different fungicides on the foliage and fruit was carefully noted, and the results obtained supplement those previously given for 1912.

In 1913 the efficiency of the first spray application was not as marked as in 1912. It was suggested in the previous account that a dilution of lime sulphur 20 per cent stronger than the standard could be used on Ben Davis trees with little danger of injury and greater efficiency, and the results in 1913 confirmed the conclusion based on the previous year's work. The use of Bordeaux mixture resulted in a smaller percentage of scabby apples, but a larger proportion of those which were russeted. The use of lime sulphur gave a very efficient control of scab and the fruit was less injured than where Bordeaux mixture was employed. Soluble sulphur used at the rate of 2 lbs. to 50 gal. of water produced severe leaf injury, although it appeared to be fairly efficient so far as the control of apple scab was concerned. The use of atomic sulphur was followed by satisfactory results, no spray injury being observed, but the author does not consider its recommendation warranted without further test.

A description is given of the use of arsenate of lead as a fungicide, and where 2 lbs. of dry arsenate of lead was used in 50 gal. of water the control of the scab was better than on the other trees except those sprayed with Bordeaux mixture and the stronger lime-sulphur solution. This would indicate a strong fungicidal action for arsenate of lead, and it is thought probable that efficient scab control with a minimum of fruit russeting might be obtained by its use, supplemented by Bordeaux mixture or a strong lime-sulphur solution used as a dormant spray.

An account is given of investigations on the source of spring infection by apple scab, previously noted (E. S. R., 30, p. 542).

Notes are also given on the observance of *Nectria ditissima* in Maine.

Some observations on the anatomy and other features of the black knot, A. STEWART (*Amer. Jour. Bot., 1 (1914), No. 3, pp. 112–126, pls. 2*).—This is a more detailed account of work reported previously (E. S. R., 30, p. 150).

Court-noué, S. BARRY (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 35 (1914), No. 5, pp. 146, 147*).—The author, giving briefly his experience in grape culture, covering some 50 years, states that while some vines under his care have been somewhat subject to court-noué for many years without very serious damage, others, including some vines of later planting, have suffered severely. A portion of the latter are now being given a trial with the coal tar treatment.

The downy mildew of the grape, G. HÉRON (*Jour. Agr. Prat. Vit. et Écon. Rurale Midi France, 109 (1913), No. 5, pp. 192–204*).—An account is given of the author's experiments for the control of the downy mildew by the use of Burgundy mixture.

On the basis of the results which he secured, he recommends the use of a freshly prepared mixture containing 2 per cent copper sulphate, or in very humid years a 3 per cent mixture. For successful control frequent applications of the fungicide should be made at the beginning of the appearance of the disease, and it is stated that the different sprayings may be profitably alternated with treatments with copper acetate or a simple solution of copper sulphate.

For proper spraying the fungicide should be applied under sufficient pressure to thoroughly vaporize the solution. In order better to cover the grapes, the removal of some of the leaves on the vine is recommended.

Comparative tests of different fungicides for the control of the downy mildew of grapes, J. MAHOUX (*Rev. Vit., 41 (1914), No. 1049, pp. 91–94*).—The author reports upon the comparative value of a dozen fungicides for the control of the downy mildew of grapes, comparisons being made with ordinary Burgundy mixture.

The season of 1913 is said to have been a very favorable one for the development of the fungus. The best results were obtained with Burgundy mixture, to which were added casein, saponin, and gelatin to increase the spreading power of the mixture, copper acetate solution, and an iron-copper sulphate solution. Ordinary Burgundy mixture gave nearly as good results, but the others tested were not favorable in their action, especially if used in more dilute strengths than advocated by their manufacturers. When sprayed upon the upper side of the foliage, as is most commonly done, none of the mixtures showed any superiority over ordinary Burgundy mixture if the amount of copper in them was less than that in the Burgundy mixture. Where the more adhesive fungicides are used, the author recommends that they should be applied from below and in such quantities as are necessary to cover the leaves and grapes. He claims there is no economy in attempting to lower the cost by reducing the amount of fungicide used in seasons that are favorable for the growth of the fungus.

Notes on diseases of citraceous plants, E. JARVIS (*Queensland Agr. Jour., n. ser., 1 (1914), No. 4, pp. 268–271*).—As the result of recent investigations the author has found a number of diseases of citrus trees, and he describes a collar rot due to *Fusarium limonis*, a root rot caused by *Armillaria* sp., and a gumming disease, the cause of which is not definitely stated. In connection with these disease preventive measures are suggested for their control.

Some notes on the scab of grapefruit, G. L. FAWCETT (*Porto Rico Prog., 6 (1914), No. 22, pp. 6, 7*).—A brief description is given of the scab of grapefruit. This the author says may be controlled by spraying with Bordeaux mixture, but as the use of the fungicide would tend to destroy beneficial fungi which hold in check scale insects, it is not thought advisable to spray except as a last resort, in which case an insecticide should follow the use of a fungicide. Control measures involve the removal of any growth that is infected, and he states that fungi occurring on cover crops, such as pigeon peas and the sword bean, will produce scabs resembling the true citrus scab. As yet no definite connection between these diseases has been determined.

The author states that his attention has recently been called to the claims that *Diplodia natalensis* causes considerable decay on fruit shipped from Porto Rico, but that he has been unable to discover it in typically affected specimens. The fruits were, however, infected with the well-known withertip fungus (*Colletotrichum glœosporioides*).

[A fungus disease of coffee] (*Planters' Chron., 9 (1914), No. 3, pp. 32, 33*).—An injurious disease of coffee trees is described as noted in the Province of Coorg, British India. It is said to occur in patches on the collar of the trees with little or no tendency to spread, but all the trees affected are usually killed, as are young healthy trees planted in their places, the fungus remaining active in the soil. It is thought the organism may be *Irpex flavus*. Remedial measures recommended include burning all affected wood, heavy liming of the soil, use of Bordeaux mixture painted on the stems, and the free admission of light and air to the affected parts.

Orobanche cumana on sunflower, A. MAL'TSEV (*Trudy Biūro Prikl. Bot. (Bul. Angew. Bot.), 6 (1913), No. 2, pp. 111–120*).—The author reports the parasitism of the above species of Orobanche on the sunflower (*Helianthus annuus*). The spread of the parasite is said to be restricted somewhat by *Phytomyza orobanchia*.

California thistle rust, A. H. COCKAYNE (*Jour. Agr. [New Zeal.], 8 (1914), No. 1, pp. 50–53, fig. 1*).—A description is given of *Puccinia suaveolens*, which is said to have become established in New Zealand where it is restricted to the California or Canada thistle (*Cnicus arvensis*) and the cornflower (*Centaurea cyanus*). The fungus is thought to be probably of some value in combating the thistle, but success in its spread will depend upon the ability to obtain artificial infections, and for this purpose studies are needed to determine the proper stage in the growth of the plant. The author believes that the best time for successful inoculation would be while the growth of healthy plants is quite young.

The symptoms of chestnut tree blight and a brief description of the blight fungus, F. D. HEALD (*Penn. Chestnut Tree Blight Com. Bul. 5 (1913), pp. 15, pls. 16*).—The author has given a description of the chestnut blight, the fungus causing it, symptoms of the disease, effects, methods of spread, etc.

Longevity of pycnospores of the chestnut blight fungus in soil, F. D. HEALD and M. W. GARDNER (*U. S. Dept. Agr., Jour. Agr. Research, 2 (1914), No. 1, pp. 67–75; abs. in Phytopathology, 4 (1914), No. 1, pp. 51, 52*).—A report is given of investigations made to determine the power of resistance of the pycnospores of the chestnut blight fungus to desiccation in the soil under field conditions during the intervals between rains and during a prolonged period of drying in the laboratory.

In the field test samples of soils taken from bases of diseased trees after a rain and after 13 days' drying gave from 84,000 to 2,412,000 viable spores per gram of soil. When dried in the laboratory there was a gradual decrease in the viable spores, the longevity limit varying from 54 to 119 days.

Pine rust and its transmission, HAACK (*Ztschr. Forst u. Jagdw., 46 (1914), No. 1, pp. 3–46, pls. 2, fig. 1*).—This is an account of studies continued from 1906 to 1913 at Eberswalde on questions connected with *Peridermium pini*.

This disease is said to appear most commonly in young foliage-bearing branches, each center being due apparently to a separate infection. The fungus is said to proceed directly from pine to pine by means of æcidiospores, requiring no intermediate host and infection occurring mostly between May 15 and July 1. Injuries to the young vegetation are thought to aid greatly the attack. Some trees appeared to be especially susceptible, some to be nearly immune to the fungus. Shoots may live some time after being seriously attacked.

Thoroughgoing removal of affected parts in case of young trees and cutting out badly diseased older trees are insisted upon as means of greatly minimizing the damage, which otherwise is considerable.

An unusual case of electrical injury to street trees, G. A. CROMIE (*Sci. Amer. Sup., 77 (1914), No. 1985, pp. 36, 37, figs. 5*).—Several examples are discussed of injury to trees by electrical currents, especially in one case following a change of the negative or return current to the overhead wire. Insulation decreased the injury done. Chemical analysis showed traces of copper and zinc in sections of wood taken some distance from the point of contact with the wire containing both these metals, which was always found to be partly eaten away at that point.

Notes on the preparation of insecticides and fungicides, V. VERMOREL and E. DANTONY (*Notes sur les Préparations Insecticides, Fongicides et Bouillies Mouillantes. Montpellier and Villefranche [1914], pp. 58*).—In this publication

a résumé is given of investigations carried on at the viticultural station at Villefranche during the past three years on insecticides, fungicides, adhesives, etc. Most of the articles referred to have been noted previously.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Comparative physiology of invertebrates, H. JORDAN (*Vergleichende Physiologie Wirbelloser Tiere. Jena, 1913, vol. 1, pp. XXII+738, figs. 277; rev. in Science, n. ser., 38 (1913), No. 971, pp. 197–199*).—This first volume deals with nutrition.

The common mole of the eastern United States, T. H. SCHEFFER (*U. S. Dept. Agr., Farmers' Bul. 583 (1914), pp. 10, figs. 4*).—This is a popular account of the common mole, its habits, nature of its injury, control measures, etc. A report of the author's studies of the common mole has been noted (E. S. R., 23, p. 752).

This mole (*Scalopus aquaticus*) is found almost everywhere south of the New England States, New York, Michigan, and central Wisconsin, except in the mountain regions. In the latter districts and in the greater part of Pennsylvania, New York, and New England the common mole is replaced by the star-nosed mole (*Condylura cristata*) and Brewer's mole (*Parascalops breweri*).

Work of California gray squirrel on conifer seed in the southern Sierras, S. BERRY (*Proc. Soc. Amer. Foresters, 9 (1914), No. 1, pp. 95–97*).—The California gray squirrel (*Sciurus griseus*) is said to be very numerous throughout the yellow and sugar pine regions of the southern Sierras during the summer months, and apparently devotes a large portion of its time to cutting pine cones. During the summer of 1910 it was observed in the act of cutting sugar pine cones over widely distributed areas within the Sierra and Sequoia National Forests during the first days of June. The squirrels are continuously at work destroying seed for a period of 3 months prior to September 1, and any seed dropped or scattered during this period is yet immature and will not germinate. Thus it appears that in the destruction of so large an amount of seed the California gray squirrel is not only a serious menace to reproduction and hinders the forestation of idle land, but its work causes the reproduction to consist mostly of the less valuable species, due to the fact that the seed of sugar pine and yellow pine is the most frequently eaten, while seed of inferior species like fir and cedar is not touched when the others can be found. It is, therefore, thought desirable that the present game laws be so amended as to remove the protection from the California gray squirrel, at least in counties where there is coniferous timber.

Squirrels and sugar pine reproduction, E. V. JOTTER (*Proc. Soc. Amer. Foresters, 9 (1914), No. 1, pp. 98–101*).—This paper relates to the destruction of sugar pine seed by squirrels, as noted above.

[Habits of pheasants], G. W. FIELD, G. H. GRAHAM, and W. C. ADAMS (*Mass. House Representatives Doc. 2049 (1914), pp. 14; abs. in Auk, 31 (1914), No. 2, pp. 271, 272*).—This special report of the Massachusetts Board of Commissioners on Fisheries and Game relative to the habits of pheasants includes a summary of the history of introduced pheasants within the State, value, methods adopted in rearing, etc.

The nutrition and habits of the angleworm in its relation to agriculture, E. KEUP (*Mitt. Deut. Landw. Gesell., 28 (1913), Nos. 39, pp. 538–542; 40, pp. 552–555; 41, pp. 466–570*).—A report of studies.

Helminthological investigations, C. GRAVIER (*Rev. Gén. Sci., 25 (1914), No. 4, pp. 149–160*).—This is a review of studies of plathelminths, nematodes, Acanthocephala, etc., published during the years 1909–1911, inclusive.

Economic zoology (*Ann. Rpt. Bd. Sci. Advice India, 1911–12, pp. 160–171*).—The first part of this paper by H. Maxwell-Lefroy deals with agricultural entomology; the second part by A. D. Imms with forest entomology.

The life story of insects, G. H. CARPENTER (*Cambridge, England, and New York, 1913, pp. 134, pl. 1, figs. 23*).—This is a popular account.

Report of the entomologist of the Arizona Commission of Agriculture and Horticulture for the year ending June 30, 1913 (*Ariz. Com. Agr. and Hort. Ann. Rpt., 5 (1913), pp. 11–48, pls. 3, figs. 11*).—The first part of this report (pp. 11–32), by A. W. Morrill and O. C. Bartlett, relates to the inspection of plant, fruit, and seed importations; the second part (pp. 33–48), by A. W. Morrill, consists of notes on the important insects of the year.

Forty-fourth annual report of the Entomological Society of Ontario, 1913 (*Ann. Rpt. Ent. Soc. Ontario, 44 (1913), pp. 131, figs. 58*).—Among the more important papers here presented are Insects of the Season in Ontario, by L. Cæsar (pp. 49–53); The Immature Stages of the Tenthredinoidea, by A. D. MacGillivray (pp. 54–75); Adaptation in the Gall Midges, by E. P. Felt (pp. 76–82); Chrysomelians of Ontario, by F. J. A. Morris (pp. 83–94); and Insect Galls, by A. Cosens (pp. 97–104).

Tuberculosis in insects, S. METALNIKOFF (*Compt. Rend. Soc. Biol. [Paris], 76 (1914), No. 2, pp. 95, 96; abs. in Rev. Appl. Ent., 2 (1914), Ser. B, No. 3, pp. 53, 54*).—In earlier papers (E. S. R., 20, p. 186; 26, p. 250) the author has shown that the tubercle bacillus when injected into the larva of the bee moth (*Galleria mellonella*) is quickly destroyed and the larva not affected. Further experiments have shown that this destruction of the bacillus is due probably to a lipolytic ferment in the body of the larva.

Experiments have also been carried on with other insects, particularly with caterpillars of *Achræa grisella*, which also feed upon the wax in beehives. Bacilli of the human type when injected in large numbers were all destroyed within a few hours. Tests of other types showed that the bovine type is quickly destroyed but the fish type cause the infection and death of the larvæ at ordinary room temperature. When the temperature was raised to 35° C. the injected fish bacilli were destroyed.

Insect damage to Russian crops (*Izv. Glav. Uprav. Zemleusgrois. i Zeml. [St. Petersb.], No. 30 (1913); abs. in Rev. Appl. Ent., 1 (1913), Ser. A, No. 11, pp. 458, 459*).—The insects mentioned as the source of injury include the Hessian fly, the wheat chafer (*Anisoplia austriaca*), the larvæ of *Phlyctænodes sticticalis* which damages the seeds of vetches, maize, beets, etc., aphids, thrips, wireworms, and cutworms.

The fight against Lachnus persicæ, termites, and ants by means of carbolineum, D. SMIRNOV (*Turkest. Selsk. Khoz [Tashkend], No. 8 (1913), pp. 783–786; abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 2, pp. 73, 74*).—The author reports excellent results from the use of carbolineum in combating plant lice (*L. persicæ*), termites (*Hodotermes turkestanicus*), and ants (*Camponotus maculatus turkestanicus*), the carbolineum acting as a repellent.

Tables for the identification of insect enemies of spruce and fir, R. KOCH (*Tabellen zur Bestimmung schädlicher Insekten an Fichte und Tanne nach den Frassbeschädigungen. Berlin, 1910, pp. VIII+112, figs. 150*).—These tables are based upon the feeding habits of the insects.

The insects attacking cork stoppers, J. FEYTAUD (*Rev. Vit., 40 (1913), Nos. 1039, pp. 565–568, pl. 1, figs. 2; 1040, pp. 598–603, figs. 4; 1045, pp. 738–740*).—A summarized account of the more important enemies of cork stoppers, which represent the Coleoptera, Isoptera, and Lepidoptera and means for their control. The tineids are said to be the most important pests.

The Hevea termite of Java, K. W. DAMMERMAN (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Afdeel. Plantenziekten, No. 3 (1913), pp. 12, pls. 2, figs. 2*).—This paper includes an account of the occurrence, injury, life history, and methods of combating *Coptotermes gestroi*, together with a list of its host plants.

The cranberry toad-bug, F. A. SIRRINE and B. B. FULTON (*New York State Sta. Bul. 377 (1914), pp. 91–112, pls. 8, figs. 4*).—The cranberry toad-bug, a fulgorid (*Phyllosoelis atri*), is reported to have caused a peculiar dying of the new growth of cranberry vines on Long Island prior to and during 1911 and 1912. It does not appear to be widely disseminated, and many bogs are practically free from it; but on two Long Island bogs, one at Riverhead and one at Calverton, the crop of fruit had been greatly reduced, the loss varying from one-half to three-fourths of a normal crop during the past three years. Wherever the insects feed on the new growth both new shoots and fruit are killed outright; while if they happen to feed only on the old wood the berries on all branches beyond the feeding point are shriveled and dwarfed.

A brief discussion of the synonomy of the species is followed by a technical description of the life stages, notes on its life history and habits, effect of its feeding on vine and fruit, enemies, and experiments with methods of control. It is stated that the cranberry appears to be the only host plant of this insect.

"There is but one brood of the insects during the year. The egg is elongate-oval in shape, with a short stalk at one end. The egg-laying period extends from September 1 to the middle of October. The female runs over the ground, dragging the egg by the stalked end, so that its viscid surface becomes covered with sand and dirt before it is dropped. Hatching begins on June 25 to 30 of the following summer, and a few may not hatch until early in August. Nymphs usually group together to feed, and may live a long time on the same branch if not disturbed. The insect has five nymphal instars. The first adults appear about the first of August, the males maturing first.

"The nymphs secrete a white, cottony substance which adheres to the branch, and this, with the excrement and molted skins, is more easily detected than the insect. The first symptom of injury is the closing in toward the branch of the leaves on the new growth.

"Tests were made of two methods of control, flooding and spraying. Of these, the former is recommended where it is possible, and should be practiced between August 1 and 15. All weeds on and near the bog should be cut. A cloudy period should be selected, and a good wind favors efficient control. Bugs on the surface of the water should be sprayed with kerosene. All grass, weeds, and drift on the shore should be burned with a burning torch-spray.

"Spraying is the only possible remedy on 'dry bogs.' When the vines contain much old wood they should be mowed at the usual season for cutting and, between August 1 and 15, sprayed with soap solution, 1 lb. to 7 gal., making two applications, using 200 gal. per acre."

Preliminary studies on the biology of the bedbug (Cimex lectularius).—III, Facts obtained concerning the habits of the adult, A. A. GIRAULT (*Jour. Econ. Biol., 9 (1914), No. 1, pp. 25–45*).—This third part of the paper previously noted (E. S. R., 28, p. 654) deals with biological observations of the adult.

The chinch bug in Ontario, H. F. HUDSON (*Canada Expt. Farms Ent. Circ. 3 (1914), pp. 13, figs. 3*).—A general account of this pest, a serious outbreak of which occurred in Ontario in 1911.

Burn the bugs (*Oklahoma Sta. Circ. 24 (1913), p. 1, fig. 1*).—This circular first presents the governor's proclamation designating December 18, 1913, as a day to be observed in destroying all hiding places in which chinch bugs had

sought winter quarters. This is followed by suggestive rules prepared by the entomologist, C. E. Sanborn, relative to burning hibernating places.

Currant and gooseberry aphids in Maine, EDITH M. PATCH (*Maine Sta. Bul. 225 (1914), pp. 49–68, pls. 4, figs. 11*).—Eight species of plant lice which have been found feeding upon currants and gooseberries in Maine are here described, three, namely, *Aphis varians*, *A. sanborni*, and *Myzus dispar*, being new to science. It is stated that none of the eight appears to pass the whole of its life cycle on currants or gooseberries.

Part 4 of a food plant catalogue of the Aphidæ of the world (E. S. R., 30, p. 854) is appended (pp. 61–68).

Suppression of the cottony cushion scale in Louisiana, E. S. TUCKER (*Louisiana Stas. Bul. 145 (1914), pp. 2–8, figs. 3*).—The cottony cushion scale (*Icerya purchasi*) was first observed in Louisiana in October, 1912, on a row of small orange trees adjacent to a nursery near New Orleans. The trees were destroyed and the pest was thought to have been eradicated but in June of the following year it was found in groves of orange, mandarin, and tangerine trees on three private estates of about 5 acres in extent. Spraying tests were made with different sprays and sprayers but inspections made in each case about two weeks after application showed a few scales to have escaped. Thus it was necessary to cut and burn all trees and other infested vegetation. It is thought that kerosene emulsion to which potassium cyanid has been added at the rate of 1 oz. to each gallon of the stock emulsion may eradicate the scale if applied in the early stages of infestation. A brief description is given of the pest, its food plants, natural enemies, etc. There is said to be no authentic record of the occurrence of this pest in Louisiana prior to 1912.

Coccidæ of Japan, V, S. I. KUWANA (*Jour. Ent. and Zool., 6 (1914), No. 1, pp. 1–11, figs. 39*).—This fifth part (E. S. R., 23, p. 54) presents descriptions of 8 species of Coccidæ new to science.

Euxoa segetum and how to combat it, A. SOPOTZKO (*Chto Takoe Ozimyi Chervi i Kak s Nim Borot'sia. Moscow: Ent. Sta. Zemstvo Govt. Tula, 1913, pp. 11, pl. 1, figs. 2; abs. in Rev. Appl. Ent., 1 (1913), Ser. A, No. 11, pp. 462, 463*).—This is a popular description of *E. segetum*, which is said to have destroyed 270,000 acres of crops in the Government of Tula, Moscow, in 1909, with an equal damage in some neighboring governments. Accounts of its life history, diseases, parasites, and methods of combating it are included.

On the appearance in Bessarabia of Clysia ambiguella, N. VITKOVSKY (*Reprint from Viestnik Vinodiel., No 7 (1913), pp. 3; abs. in Rev. Appl. Ent., 1 (1913), Ser. A, No. 11, p. 461*).—This enemy of the vine is said to occur in great numbers in Bessarabia, Crimea, Caucasus, and the Government of Astrakhan.

The appearance of Phlyctænodes sticticalis in increasing numbers, and also of the larvæ of Cassida nebulosa, E. M. VASSILLIEV (*Trudy Opytn. Ent. Stantsii Vseross. Obshch. Sakh. Zavod. [Kief], 1912, pp. 31–45, figs. 5; abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 2, p. 63*).—This presents biologic and economic data.

Tortrix forskaleana, I. TRÄGÅRDH (*Meddel. Centralanst. Försöksv. Jordbruksområdet, No. 15 (1914), pp. 20, figs. 17*).—An account of the life history of this tortricid enemy of the maple based upon studies made in the vicinity of Stockholm.

On German gall flies and galls, E. H. RÜBSAAMEN (*Ztschr. Wiss. Insektenbiol., 6 (1910), Nos. 4, pp. 125–133; 6–7, pp. 199–204; 8–9, pp. 283–289; 10, pp. 336–342; 12, pp. 415–425; 7 (1911), Nos. 1, pp. 13–16; 2, pp. 51–56; 3, pp. 82–85; 4, pp. 120–125; 5–6, pp. 168–172; 9, pp. 278–282; 11, pp. 350–353; 12, pp. 390–394;*

8 (1912), Nos. 2, pp. 48–51; 3, pp. 97–102; 5, pp. 157–162; 6–7, pp. 214–218; 8–9, pp. 284–289; 11, pp. 354–357; 12, pp. 376–379, figs. 73).—This account includes descriptions of many new genera and species of Itonididæ (Cecidomyiidæ).

On a method of fighting Psila rosæ, E. M. VASSILIEV (*Reprint from Sadovod i Ogorodnik [Kief], 1913, pp. 6; abs. in Rev. Appl. Ent., 1 (1913), Ser. A, No. 11, p. 463*).—This circular relates to the carrot fly which occurs in the neighborhood of St. Petersburg and Moscow, and in the Government of Moghilef and Poland.

Controlling flies, A. F. CONRADI ET AL. (*South Carolina Sta. Circ. 23 (1913), pp. 14, figs. 6*).—This general account, with control measures for the house and stable fly, includes a report of work carried on with traps and sprays during the season of 1913. Laboratory tests in spraying manure showed that 98 per cent of the maggots were killed in 24 hours with a solution of arsenite of soda 4 lbs., molasses 2 qt., and water 50 gal.

Corn-leaf blotch miner, W. J. PHILLIPS (*U. S. Dept. Agr., Jour. Agr. Research, 2 (1914), No. 1, pp. 15–31, pls. 5, figs. 6*).—While the corn-leaf blotch miner (*Agromyza parvicornis*) up to the present time has not proved to be a serious pest, mainly because of the large number of parasites that attack it, it is pointed out that considerable injury may be done in their partial absence.

In young corn plants and in the small grasses and grains the larvæ work from the tip of the leaf toward the base, devouring all of the tissue between the upper and lower epidermis. In small plants the larvæ work the entire width of the leaf, leaving only the epidermis of the upper and lower surfaces. Soon after the work is done the leaves have a colorless appearance and in a few days they turn brown and curl up. One larva is said to be sufficient to destroy a young corn leaf although as many as four have been found in a single leaf in the field and as many as eight or ten in a leaf in the rearing cages. When the plants become older and tougher the miners do not devour all the tissue between the two leaf surfaces, thus the greatest injury is wrought when the plants are young. If very abundant, however, the larvæ could cause serious injury to corn in advanced stages of growth.

The species seems to show a preference for corn, next to which it prefers the broad hairy-leaved varieties of millet. Occasionally it is found in crab-grass (*Panicum sanguinale*), and breeds readily in barnyard grass (*Echinochloa crus-galli*). This leaf-miner has quite a wide range of distribution, having been found as far north as Wisconsin, as far east as Washington, D. C., and New England, as far south as Alabama and Florida, and as far west as Salt Lake City, Utah, as well as in Texas, and probably occurs throughout the United States wherever corn is grown.

The author presents a technical description of the several stages of this insect and a somewhat detailed report of its life history and natural enemies. The incubation period of the egg may be as short as 80 hours in the latter part of July. In midsummer the larvæ have been found to obtain full growth in 4 days while the pupal stage may be as short as 14 days. From 30 to 60 eggs have been observed to be deposited. Observations show that there are 4 complete generations and a part of a fifth. In the latitude of La Fayette, Ind., at least, it passes the winter in the puparium only. Brief notes are also given on its life history in Florida based on observations by G. G. Ainslie.

The author reports that there are 18 species of hymenopterous parasites which attack *A. parvicornis*, 3 being braconids and 15 chalcidoids. Of these parasites *Derostenus diastatae* is by far the most abundant and probably the most important. *Diaulinus websteri* and *D. begini* have also been reared quite plentifully and are probably next in importance. Notes are presented on the

18 parasites, the life history of none of which has been worked out completely. It is stated that on no occasion have remedial measures been required.

A bibliography of 12 titles is appended.

A new species of grass grub.—A serious pest of seedling forest trees, A. H. Cockayne (*Jour. Agr. [New Zeal.], 6 (1913), No. 3, pp. 295–298, fig. 1*).—A new scarabæid pest, a description of which under the name *Odontria punctollis* by Broun is appended, is said to be the source of considerable loss in the seedling beds at the state forest nurseries at Whakarewarewa through the destruction of the roots of the young trees by the larvæ.

The life history and bionomics of Cryptorhynchus lapathi. F. Scheidter (*Naturw. Ztschr. Forst u. Landw., 11 (1913), No. 5–6, pp. 279–300, figs. 6*).—A report of the biological studies of the poplar and willow borer.

On the biology of Tropinota turanica, N. N. Troïtzky (*Reprint from Jour. Agr. Turkest. [Tashkend], No. 6 (1913), pp. 18, figs. 2; abs. in Rev. Appl. Ent., 1 (1913), Ser. A, No. 11, pp. 437, 438*).—This cetoniid beetle is a prominent and regular pest of orchards in Tashkend, injuring the blossoms of apricots, cherries, thorns, apples, pears, strawberries, etc. It attacks only the unfertilized blossoms, eating away the ovaries, pistils, and stamens, but doing no great damage to the petals. The injury is done only by the perfect insect, the eggs being laid in the fields, where the larvæ feed on roots of various plants.

On an egg-eating parasite of Rhynchites auratus, N. N. Troïtzky (*Reprint from Jour. Agr. Turkest. [Tashkend], No. 5 (1913); abs. in Rev. Appl. Ent., 1 (1913), Ser. A, No. 11, pp. 436, 437*).—A chalcidid, apparently belonging to the genus Oophthora, is said to have parasitized 88 per cent of the eggs of this weevil in Tashkend in 1912.

Contributions to our knowledge of the British Braconidæ.—I, Meteoridæ, G. T. Lyle (*Entomologist, 47 (1914), Nos. 610, pp. 73–77, pl. 1; 611, pp. 119–125*).—The author states that he knows of no instance of a meteorid hibernating in the perfect state. With several species the winter is passed within the body of the host, either as an ovum or young larva, and with a few others as a larva within the cocoon.

Life histories of Indian insects.—IV, Hymenoptera, G. R. Dutt (*Mem. Dept. Agr. India, Ent. Ser., 4 (1912), No. 4, pp. 183–267, pls. 4, figs. 22*).—This part (E. S. R., 26, p. 654) deals with the life histories of various species of Hymenoptera, including species of the families Mutillidæ, Thynnidæ, Scoliidæ, Pompilidæ, Sphegidæ, Eumenidæ, Apidæ, and Formicidæ.

Spider enemies of bees, R. J. Levandovsky (*Russ. Pchelovod. Listok [Moscow], 1913, Nov., pp. 378–387; abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 2, pp. 64, 65*).—A report of personal observations with a list of the spiders implicated.

Bryobia prætiosa, I. Trägårdh (*Meddel. Centralanst. Försöksv. Jordbruksområdet, No. 17 (1914), pp. 24, figs. 7*).—A review of the literature leads the author to conclude that the different species described under the names of *prætiosa, speciosa, nobilis, gloriosa, ribis,* and *pratensis* must be referred to *prætiosa* K., being mere variations and different instars of that species. This pest is said to be found all over Europe, southward as far as Egypt, northward to the arctic regions, and in the United States.

Transmission of Trypanosoma cruzi by Rhipicephalus sanguineus, A. Neiva (*Abs. in Bul. Inst. Pasteur, 12 (1914), No. 1, pp. 45, 46*).—Five male ticks (*R. sanguineus*), detached after death from a dog that had been inoculated with *T. cruzi* and was also infected with *Piroplasma vitali,* were placed upon a healthy dog and 19 days later the latter dog was found to be infected with *T. cruzi.*

Rocky Mountain spotted fever, L. D. FRICKS (*Pub. Health Rpts. [U. S.], 29 (1914), No. 17, pp. 1008–1020*).—This progress report, dealing with investigations made during 1912 by the late T. B. McClintic, relates to infective ticks in nature, the discovery of immune ground squirrels (*Citellus columbianus*), susceptibility and immunity experiments with woodchucks (*Marmota flaviventer*), etc.

The experiments seem to indicate that a tick attaching itself to a woodchuck at any time within a period of 11 days after its inoculation would become infected. In a series of experiments with rock squirrels (*Callospermophilus lateralis cinerascens*), which had been injected with spotted fever virus, four transmitted the infection to guinea pigs through the injection of 0.75 cc. of heart blood on the fifth day.

It is stated that there is no evidence to support the belief that the mountain goat can acquire or transmit Rocky Mountain spotted fever infection.

FOODS—HUMAN NUTRITION.

On certain changes in the composition of the nitrogenous constituents of meat extracts, A. M. WRIGHT (*Trans. New Zeal. Inst., 43 (1910), pp. 7, 8*).—Analyses are reported of extract liquor before concentration, of extract prepared in an open pan, and of extract prepared in a partial vacuum, and the differences in the chemical composition between the resulting product and the original substance discussed.

In the case of the extract made by the vacuum method, "the proportion of the organic matter decreases, while the mineral salts increase; otherwise the composition of the vacuum-evaporated extract is very nearly that of the original liquor calculated to a 20 per cent moisture content, the acidity, insoluble and coagulable proteids, proteoses, and total meat bases being present in about the same amounts in each case. In the original liquor there were no peptone-like bodies, whereas in the vacuum-concentrated extract there were found 0.31 per cent of these substances.

"The extract concentrated in the open pan is very different in composition from either the original liquor or the vacuum extract: The proportion of the organic matter has decreased, and the mineral salts increased considerably; the total nitrogen remains about the same, but the forms in which the nitrogen is present have undergone considerable change; about three-fifths of the insoluble and coagulable proteids have been rendered soluble and converted to other nitrogenous substances; there is a decrease in the amounts of proteoses and meat bases; while against these decreases there is found 8.69 per cent of peptone-like bodies which are absent in the original liquor, and present in the vacuum extract to only 0.31 per cent. The acidity has increased by over 3 per cent.

"The peptone-like bodies and polypeptids are bitter in taste, and it is found that extracts containing relatively large amounts of these bodies have a decidedly bitter taste. . . .

"As but very small amounts of peptone-like bodies are present in vacuum-concentrated extract, and but little change in the composition of nitrogenous bodies is found, it is probable that the prolonged action of heat on the nitrogenous material in the presence of the normal flesh acids and salts, the amount of which increases as the evaporation proceeds, is the cause of the marked change in composition found in the open pan concentrated extract. The so-called 'burned' flavor sometimes found in meat extracts is doubtless due to the same cause, for in vacuum-concentrated extract no such undesirable flavor is noted."

The chemical composition of meat extract, A. M. WRIGHT (*Trans. New Zeal. Inst., 43 (1910), pp. 1–6*).—Analytical data are reported of meat extract, including mineral matter as well as other constituents, and a yeast extract, and the results discussed. The meat extract, the author points out, has little food value, but he regards it as "most valuable as a dietary adjunct."

The food value of skim milk and the nutritive value of condensed skim milk (*Riv. Sci. Latte, 3 (1913), No. 5, pp. 71–78*).—The relative cost and nutritive value of skim milk and a number of other common food materials are compared. A comparison is also given of the nutritive ratios of several brands of condensed skim and whole milks.

Eggs considered from the point of view of food value, L. DELAYE (*Bul. Soc. Salubrité, Prov. Liége, 16 (1913), pp. 67–85; Bul. Soc. Chim. Belg., 27 (1913), Nos. 8–9, p. 236; 12, pp. 310, 311*).—The nutritive value of eggs is discussed and statistics regarding egg production, particularly in Belgium, are given.

Lard, A. MCGILL (*Lab. Inland Rev. Dept. Canada Bul. 272 (1913), pp. 21*).—Out of 182 samples purchased in Canada, 169 were found to be genuine. Eight of the remainder were adulterated and three contained an excess of water. The adulteration in all cases consisted of added foreign fat of vegetable origin.

Vegetable foods; their distinctive characteristics and classification, H. H. RUSBY (*Jour. N. Y. Bot. Gard., 15 (1914), No. 169, pp. 1–5*).—A summary of a lecture delivered at the New York Botanical Garden calling attention, among other things, to the similar nutritive value of foods derived from the same general botanical family. The author outlines briefly a system of calculating the nutritive value of rations, employing a method which involves the expression of the nutritive value of foods by their equivalents in carbohydrates, but does not take into account the twofold function of nitrogenous foods.

The digestion of vegetable foods, W. J. GIES (*Jour. N. Y. Bot. Gard., 15 (1914), No. 169, pp. 5–9*).—In this abstract of a lecture delivered at the New York Botanical Garden the author summarizes in schematic form data regarding digestibility.

Gastric digestion of the proteins of bread and raw meat in man, E. ZUNZ and M. CERF (*Bul. Acad. Roy. Med. Belg., 4. ser., 27 (1913), No. 6, pp. 552–581*).—The problem was studied with normal men and women, with subjects with cancer of the stomach, and with laboratory animals (dogs and a cat). Horseflesh was used in the experiments with man and beef or horseflesh in the tests with laboratory animals. In the tests with man the stomach contents were removed and examined an hour after the ingestion of raw meat, raw meat and bread 3:1, and raw meat and bread 1:1. Data are given regarding the kind and proportion of the different proteids found in the stomach contents in each test.

The authors conclude that in normal individuals about 60 per cent of the protein was unchanged (i. e., was still coagulable). Of the remainder, or incoagulable portion, acid albumins made up from 7 to 14 per cent; proteoses, from 60 to 65 per cent; and peptones and polypeptids, a little over 25 per cent. Judging by the results obtained, gastric digestion does not proceed so far in normal man as in the dog.

The chemical composition of a number of corn-meal products and the digestibility of the nitrogenous material by pepsin and hydrochloric acid, in comparison with the digestibility of protein substances in certain other cereals and legumes, O. RAMMSTEDT (*Arch. Hyg., 81 (1913), No. 6, pp. 286–306*).—Proximate analyses are reported as well as more detailed analyses of the protein, carbohydrate, and phosphorus content of different samples and also the results of artificial digestion experiments. A feature of this work was the

comparison of corn, wheat, and rye products cooked in water and in milk with similar products uncooked, with reference to the digestibility of protein substances and with respect to changes in the total sugar and other water-soluble material.

According to the author's summary, corn-meal products as compared with other vegetable foodstuffs are relatively rich in protein, fat, and carbohydrates, and in respect to the digestibility of their constitutents are directly comparable with other cereals and with legumes. The corn products are cheaper than similar products from wheat and rye. Furthermore, a very great variety of palatable dishes can be prepared from corn meal in relatively simple ways without waste. As is the case with other foods, the protein is rendered somewhat less soluble by cooking. On the other hand, the carbohydrates are naturally rendered more soluble. The latter is more conspicuously the case with the carbohydrates of wheat and rye than with the carbohydrates of corn products. However, one can obtain as good results with corn meal by longer cooking, and in the end the foods made from corn are equally palatable and are cheaper than those made from wheat and rye.

The influence of artificial drying on the quality of grains for bread making, II, M. P. NEUMANN (*Ztschr. Gesam. Getreidew., 5 (1913), No. 12, pp. 329–341, figs. 3*).—In continuation of work previously noted (E. S. R., 30, p. 257), the author reports the results of investigations on the artificial drying of wheat with reference to bread making quality. The conclusions drawn were in effect as follows:

Natural drying, such as results when the grain is cut in the "yellow ripe" stage can be replaced within limits by drying with artificial heat. When artificial drying is resorted to, the temperature of the grain should not exceed 45° C. When the harvest is normal, artificial drying has no practical importance but is to be recommended if the weather conditions at the time of cutting and harvesting the grain are unfavorable for complete ripening. Additional experiments are needed to determine whether or not higher temperatures can be used in the case of the drier grains without lowering bread-making quality. Experience already gained indicates that this is not the case. The experiments clearly show that the method of harvesting, and especially the way the wheat dries out in the field, has a decided influence on baking quality and its commercial value.

The effects of nitrogen peroxid on the constituents of flour in relation to the commercial practice of bleaching flour with that reagent, B. MOORE and J. T. WILSON (*Jour. Hyg. [Cambridge], 13 (1914), No. 4, pp. 438–466*).—Extended investigations led the authors to the following conclusions:

"Bleached flour is not known to be bleached by the great majority of those who consume it.

"There does exist a demand for whiteness in flour, and previously to the advent of bleaching this was based on a real difference between white superfine flour and the cheaper yellower flour called 'household' or 'bakers'' flour. The difference consists in this, that the superfine contains the ripest and best part of the flour or 'cream of the wheat,' while the lower grade consists of less ripe or less developed endosperm and is richer in oil which contains the coloring matter carrotene, and so is yellow in color. Bleaching by decolorizing the carrotene removes a criterion of quality between the two grades of flour and allows the cheaper quality to be admixed with the dearer, and the whole to be sold as first quality.

"That this admixture is made possible is shown in two ways: First, the sellers of the bleaching apparatus advertise in milling journals that the process enables the miller to increase his 'divide,' and secondly, there are

minute microscopic particles of offal in the products of the lower machines which are not bleached or altered in the process, and which serve the microscopist as a guide to how the flour has been blended. Examination of commercial flours shows clearly that a large number of high-priced flours are such mixtures and could not be sold as such unless previously bleached.

"Bleaching confers no advantage in nutritive properties or flavor upon the flour, and the large sum spent upon bleaching flour is really a national waste.

"Bleaching flour with considerable amounts of nitrogen peroxid alters both fats and proteins by nitrating them. Although the changes at the level of commercial bleaching are small, there is no knowledge as to how the small amounts of organic nitro-bodies formed may affect the human body in prolonged use for years, and as there is no counterbalancing advantage, and an addition also to the price obtained by simulating a superior article, it is suggested either that bleaching should be prohibited, or regulated and notified clearly by label to the purchaser.

"Bleaching by nitrogen peroxid is not a more rapid achievement of a slowly occurring natural process, but is essentially distinct. For while natural whitening in pure air consists in an oxidation of the coloring matter, bleaching consists in the formation of additional compounds between nitrogen peroxid and the coloring matter."

The chemical composition of paddy mill products, F. J. Warth and D. B. Darabsett (*Dept. Agr. Burma Bul. 10 (1913), pp. 11*).—Rice milling is described and analytical data including mineral constituents reported of the different milling products and by-products. Some data are also reported regarding pounding rice by hand as compared with commercial milling. The hand process, the authors point out, is clearly wasteful, since none of the hand-milled, broken rice is used for cooking but for cattle food. The marked preference of the natives for the polished rice is commented on.

According to the authors, "the two foods polished rice and wheat flour may be considered equally good when they form part of a mixed diet in which the extra proteid required is supplied from some other source. Where, however, rice forms the complete diet the nutritive ratio (proteid to carbohydrates) is very low and a small increase in proteids would considerably alter it. It is just possible, therefore, that a part of the ill effects of a diet of polished rice may be due to the very low proteid content.

"For the rice miller, however, the phosphorus content has become a much more urgent problem since it has been shown that an inadequate supply of this element is a predisposing cause of beri-beri. . . . It is important to notice that wheat flour is, if anything, poorer in phosphoric acid than our best polished Rangoon rice. However, wheat flour consumers invariably live on a mixed diet, whilst some rice eaters do not. This explains why no complaint has been raised against the low phosphoric acid content of wheat flour."

Discussing the matter from the Burmese native standpoint, the authors state that "the more perfect the polish the better does the rice cook, and therefore the preference for highly polished rice is not merely due to its clean white appearance but to the good cooking quality indicated by its appearance.

"It is doubtful whether we have as much reason for preferring white bread as the rice eater has for preferring well polished rice. The question of cooking quality in relation to extent of polishing is one that deserves some study by the millers. It may just be possible to produce a good cooking rice without polishing quite as much as is the custom. . . .

"A chemical test bearing on the question of cooking quality may be mentioned here. By means of dilute alkali rice grains can be disintegrated and

eventually gelatinized, but this action does not take place at all until the outer layers of the grain have been removed."

On the powdered sugar of commerce, E. H. S. Bailey and H. L. Jackson (*Trans. Kans. Acad. Sci., 26 (1912), pp. 27, 28*).—The authors point out that although there are about 30 different grades of sugar on the market, only a small number are ordinarily handled in retail trade.

Over 20 samples of "the finest grade of powdered sugar, namely, the XXXX," were examined with reference to adulteration. Of the 20 samples analyzed, 5 contained starch, the maximum quantity being 4 per cent. In one sample, in which the label stated that 2 per cent of starch was present, none was found. "It is not uncommon, however, to find that the label does not truthfully describe the contents of the package. There was no indication of the presence of other substances than pure cane sugar in the samples examined."

The authors' commentary on the use of starch follows: "As one requirement for powdered sugar is that it should be fine and free from lumps, some of the manufacturers have been putting a little starch into the sugar during the process of grinding. This can hardly be called adulteration, however, as it is not put in with the object of cheapening the product, but to improve its quality for a particular purpose. Starch is, furthermore, a food product, although less expensive than sugar. A mineral substance, if added to the sugar, would be considered an adulteration, as mineral substances are especially forbidden for use in sugar or confectionery."

With reference to the cost of some grades, it is pointed out that "those sugars upon which most work has been done in the process of manufacturing sell for a higher price, but the cost to the consumer of such grades as cube sugar and powdered sugar is entirely out of proportion to the increased cost of manufacture. In fact, these grades are to be classed as luxuries, or foods to be purchased only if the consumer has sufficient income so that he can afford to buy them."

The chemistry of a cup of coffee (*Lancet [London], 1913, II, No. 22, pp. 1563–1565*).—In this paper data are given regarding caffein in tea and coffee, the chemical composition of hot and cold coffee infusions, and some of the factors affecting the quality of coffee, together with a discussion of its food value.

Tea contains from 3 to 4 per cent of caffein and coffee seldom more than 1 per cent, but infusions of tea and coffee as commonly prepared contain practically equal amounts of caffein in equal volumes of liquid, since a much smaller quantity of tea is used. Since cold water extracts all the caffein in coffee and only a little of that in tea, it appears that the caffein in coffee has different chemical associates from the caffein in tea. According to the authors, "the caffein in tea is for the most part combined with tannin in the form of caffein tannate, which is not very soluble in cold water, but is easily soluble in hot water. . . . Subsequent experiments showed that the caffein in coffee is combined with a peculiar acid allied possibly to tannic acid, but exhibiting different properties from the tannin present in tea."

From the fact that the caffein tannate of tea is precipitated by weak acids, and therefore probably precipitated by the gastric juice, it is assumed that the caffein is not absorbed until it reaches the alkaline alimentary tract. The caffein of coffee, however, is soluble in both alkaline and acid fluids, and is therefore probably absorbed in the stomach.

If this is true, coffee, and its physiological action is for the most part due to caffein, should act more promptly than tea as a stimulant and restorative. This is borne out by the fact that coffee is generally regarded as a more powerful restorative than tea.

Studies of the chemical composition of hot and cold water infusions of several types of coffee revealed the fact that cold water extracted from coffee the same weight of materials as boiling water, but the cold water infusion is somewhat less palatable than the latter. There was little chemical difference between them, and the physiological effect of the cold water extract of coffee was presumably the same as a hot water infusion, except for esthetic considerations. According to the report, "it is probable that cold water fails to extract certain oily bodies or fats which contribute attractive taste and aroma. The total extract is frequently higher in cold than in hot water. . . . Cold water extracts from tea only 17.5 per cent of its total caffein, while from coffee it extracts the whole. Similarly, cold water extracts from tea 13 per cent of its total tannin, while coffee under the same treatment yields practically the whole of its caffetannic acid."

An infusion of unroasted coffee has a disagreeable taste, the roasting process being necessary to render the coffee palatable. The chemistry of roasting consists largely of a caramelization process, with the formation of certain oils and aromatic principles. Little caffein is lost in the process, but the amount of caffetannic acid is diminished considerably, a greater reduction taking place in the preparation of the "high roasted" coffee than in the "pale roasted" coffee.

In this investigation no relation could be traced between the esthetic quality of coffee and the chemical composition of the infusions. No important difference in the amount of caffein was found between the common and the finest varieties. The flavor, body, and aroma of the coffee are probably due to small amounts of oil bases or aromatic principles which are formed during the roasting process. The esthetic quality of coffee depends in a great degree upon the care spent in the roasting process. Pyridin was also found, but not in sufficient quantities to estimate.

From these observations, the following conclusion as to the food value of coffee is drawn: "The infusion of coffee presents practically very little material that is of direct nourishing value, but by diminishing nervous fatigue, by virtue chiefly of the caffein present, it may increase muscular power. It is not itself a builder of tissue. The use of coffee after dinner, it is of interest to note, is justified in a large number of cases by the fact of its stimulating effect upon the vital centers, and it is said to serve to some extent as an antidote to alcohol. It is commonly claimed to remove drowsiness; as a matter of fact, in many subjects it produces drowsiness, but this is usually followed quickly by marked wakefulness. The practice of drinking coffee after a meal for the sake of the stimulus which is experienced has much to be said in its favor dietetically. There is no reason for supposing that coffee possesses any value as a food."

On the composition of the essence of coffee—the presence of pyridin, G. BERTRAND and G. W. WEISWEILLER (*Bul. Sci. Pharmacol., 20 (1913), No. 12, pp. 705–707*).—In several samples of freshly roasted and ground coffee amounts of pyridin were found, varying from 200 to 400 mg. per kilogram. Experiments were carried out which would indicate that the aroma of coffee is due to pyridin. Methods of analysis are described, and the suggestion is advanced by the authors that pyridin may possibly play an appreciable rôle in the physiological effect of coffee infusion.

Commodities and provisions (*Ann. Statis. Paris, 32 (1911), pp. 242–306*).—Statistics are given regarding the meat trade, dairy products, eggs, grains, and other food supplies entering into commerce.

Municipal laboratory of chemistry (*Ann. Statis. Paris, 32 (1911), p. 307*).—According to the summary presented, 27,282 analyses were made during the year 1911, the bulk of them of food products and beverages.

Construction, equipment, and operation of public slaughterhouses and markets, O. SCHWARZ and H. A. HEISS (*Bau Einrichtung und Betrieb öffentlicher Schlacht- und Viehhöfe. Berlin, 1912. 4. ed., enl., pp. XVI+1065, figs. 499*).—This exhaustive work is designed as a handbook for slaughterhouse officials, slaughterhouse veterinarians, and sanitary and other inspectors.

The school lunch system [in the Philippines] (*Ann. Rpt. Bur. Health P. I., 14 (1912–13), pp. 21–24*).—An account is presented of the school lunch system which has been established in Manila schools and which forms a part of the school work in domestic science.

Menus are given as well as information regarding the prices at which the different foods are sold and some general data regarding the expenses of maintaining the project, which is designed simply to be self-supporting. The school lunch project was started in order that wholesome foods might be provided at moderate cost in place of those the children were accustomed to buy outside of school.

"To one who has worked any time in the city schools there is no doubt as to the utility and benefit of the lunch system. For many of the pupils it is the only breakfast that they get, while generally it is also the most wholesome meal of the day. A medical inspector who was formerly detailed in the city schools stated that a medical examination of the pupils made about a year after the lunch system was established showed an improvement of 90 per cent in their health."

The ship's commissary officer, G. P. DYER (*Annapolis: U. S. Naval Inst., 1913, pp. 66, figs. 7*).—This publication deals with the general subject of food purchase, preparation, and service on vessels of the U. S. Navy.

As the author points out, "a ship's efficiency is largely dependent on contentment, and contentment, in turn, on the fare. Variety of fare [is] more a function of contentment than quantity. Given contentment, economy in food cost is an object."

Food service, it is pointed out, involves cleanliness, "mainly a question of equipment," and celerity, "mainly a question of mess men." The equipment is fully described and the routine of food service.

The galley, its personnel, and equipment are discussed, as are also bill-of-fare making, galley cooking and service, and the ship's bake shop and butcher shop.

In an appendix are given specimen bills of fare with quantities (800 men for 1 week) and costs for vessels at sea, in port, in summer, and in winter.

Directions are given for preparing some of the foods enumerated. A partial list is also given of the dishes which can be served in a general mess based on experience on two ships during five years' cruising, and examples are quoted of typical bake shop and galley orders with outlines of the day's routine. Some of the data are of general interest, as the sort of yeast suitable for the Tropics.

The work involved in the combustion processes of the body: The physiology of muscular work, R. HÖBER (*Ztschr. Elektrochem., 19 (1913), No. 19, pp. 738–746; abs. in Chem. Zentbl., 1913, II, No. 21, p. 1814*).—This paper, delivered at the meeting of the Bunsen Society of Applied Physical Chemistry, Breslau, August, 1913, is a summary of the advance made in the knowledge of the chemodynamics of muscle from the time of Fick to the present.

According to the author, a muscle is to be regarded as a chemodynamical and not a thermodynamical machine, since it has so high an effectiveness that

one would have to take into account extremely high temperatures if a thermodynamical explanation were offered.

The chief work reaction which causes contraction depends upon the formation of lactic acid. As yet the origin of the lactic acid is not known. Probably it does not come directly from glycogen or from dextrose. When muscle is stimulated and fatigued, the lactic acid disappears, oxygen being taken up and carbon dioxid given off, not, however, by means of simple combustion but through the regeneration of the lactic-acid-yielding substances coupled with an oxidative process. Muscular contraction is apparently brought about by a swelling which is itself brought about by the presence of the acid. The laws of the increased volume phenomena are the same as those for the dilution of concentrated solutions. In this case, as in the case of the muscle, practically all the energy changes can be noted as work.

A discussion follows the paper.

Protozoan protoplasm as an indicator of pathological changes.—III, In fatigue, F. P. UNDERHILL and L. L. WOODRUFF (*Jour. Biol. Chem., 17 (1914), No. 1, pp. 9–12*).—From the experimental data which they report, the authors believe that "it is justifiable to conclude that the character of the chemical changes occurring in fatigued muscle must differ only slightly from the normal."

ANIMAL PRODUCTION.

Live stock on farms and elsewhere (*Thirteenth Census U. S., 5 (1910), pp. 327–472, pls. 7, figs. 10*).—The total value of all live stock on farms in the United States on April 15, 1910, was $4,925,174,000. Of this total, domestic animals represented 96.6 per cent and poultry most of the remainder.

During the decade 1900–1910 the value of live stock on farms increased 60.1 per cent. The increase was shared by every geographic division. The largest absolute increases were in the West North Central and the East North Central divisions, though with respect to percentages of increase the Pacific division ranked highest, closely followed by the South Atlantic division. The highest percentage of increase was in the West. The North reported in 1910 a little over three-fifths of the total value of all live stock on farms in the United States, the South somewhat over one-fourth, and the West about one-eighth. The average value of live stock per farm for the United States as a whole was $774 in 1910, for the North $1,029, for the South $428, and for the West $1,673.

In value of domestic animals Iowa outranked all other States in 1910, followed in order by Texas, Illinois, Missouri, Kansas, and Nebraska, each reporting over $200,000,000. In value of poultry Iowa also ranked first, followed by Missouri and Illinois, each with over $10,000,000.

Data are given in detail for cattle, horses, mules, swine, sheep and goats, poultry, and bees on farms, and of domestic animals not on farms.

Live stock products and domestic animals sold or slaughtered on farms (*Thirteenth Census U. S., 5 (1910), pp. 473–529, figs. 3*).—There were on April 15, 1910, 598,047 farms, or 9.4 per cent of all farms in the United States, with sheep of shearing age, the number of such sheep being 39,644,000.

The value of the wool clipped was $45,670,000 in 1899 and $65,472,000 in 1909. The average value per fleece increased from $1.04 to $1.55, and the average value per pound from 17 to 23 cts. Of the three principal wool-producing divisions, the East, North Central, and Pacific each reported a smaller proportion of the total wool clip in 1909 than in 1899, and the Mountain division a larger proportion. The most important State in the production of wool was Wyoming, with Montana, New Mexico, Ohio, California, Idaho, Oregon, and Texas ranking in order named.

The average weight of fleece increased from 6.3 lbs. in 1899 to 6.8 lbs. in 1909. The highest average weight was in the Mountain division, 7.3 lbs. per fleece.

The total reported production of mohair in 1909 was 1,683,000 fleeces and the value $902,000. A decrease in the average value of mohair per pound is noted.

The total production of eggs in 1909 was estimated at 1,591,311,000 doz., an apparent increase of 23 per cent over that of 1899. The value of eggs is given as $306,689,000, or an increase of 112.6 per cent over 1899. The average value of eggs per dozen as reported by the farmers increased from 11.1 cts. in 1899 to 19.3 cts. in 1909. The number of fowls reported as sold in 1909 was 153,600,000, or about one-third of the number raised. In 1909, 28 per cent of the total number of eggs produced and 25.4 per cent of the total number of fowls raised were accredited to the West North Central division, and 24.7 and 21 per cent to the East North Central. The average value of all fowls raised in 1909 ranged from 66.1 cts. each in the New England division to 29.9 cts. in the West South Central division, while the value of those sold ranged from 70.9 to 34.5 cts.

Feeding corn silage to farm animals, W. H. Pew, J. M. Evvard, and H. H. Kildee (*Iowa Sta. Circ. 6 (1913), pp. 6*).—In this circular general instructions are given for the feeding of corn silage to the breeding herd of beef cattle, fattening lambs, yearling sheep, horses, hogs, fattening cattle, wintering ewes and lambs, and to dairy cattle.

[Analyses of feeding stuffs] (*Off. Bul. Ohio Agr. Com., 4 (1913), No. 3, pp. 56–58, 80–97*).—Analyses are reported of cotton-seed meal, malt sprouts, linseed cake, blood meal, meat scraps, tankage, dried beet pulp, molasses feed, distillers' grains, middlings, oat hulls, gluten feed, bran, hominy feed, alfalfa meal, germ oil meal, and various mixed and proprietary feeds.

[Animal husbandry], T. L. Haecker (*Minnesota Sta. Rpt. 1913, pp. 25–30, fig. 1*).—Four or 5 dry-brood sows representing the principal breeds were placed on each of 6 different lots of forage crops, stocking each pasture to its capacity, but not overstocking. Under these conditions it was estimated that a 5-acre plat of rape would have a net value of $70.85, of oats, peas, and rape $58.75, of oats $9.49, of corn $20.60, and of sorghum $4.20. The first two lots were the only two in which any individual sows gained consistently during the experiment. Young sows showed more gains and less losses in weight than old sows. No breed showed superiority over other breeds in making gains on pasture. The sows that had been on grain without pasture proved as good breeders as those on pasture without grain for the same period.

Data secured on the composition of the body of a steer at all stages of growth indicate that there is a rapid increase in protein in the early stages of life, which is followed by a marked slowing up when the animal reaches a weight of about 800 lbs. This is just opposite to the results secured for fat, in which the increase is slow during the early stages, but shows rapid gain from about the 600-lb. stage. It was found that disturbances ordinarily not thought of as important cause a decrease in the rate of gain and in some cases an actual loss of weight.

The brains of the domestic animals, H. Kraemer (*Mitt. Deut. Landw. Gesell., 29 (1914), No. 4, pp. 55–58*).—Data are given on the brain capacity and weight of brains of various breeds of horses, mules, cattle, sheep, hogs, and dogs, and the relative weight of brain to body weight is compared for the various animals.

The importance of measurements in the improvement of the breeds, C. Voitellier (*Ann. Sci. Agron., 4. ser., 3 (1914), No. 1, pp. 1–13*).—This reports

body measurements taken of prize cattle of various ages. The measurements included are height at the withers, back, sacrum, and chest; size of the chest, quarters, and trochanter; length of the pelvis and trunk; and perimeter of the chest and anterior cannon.

From this, the relation of selection and improvement of cattle to their body measurements is clearly shown and it is suggested that a systematic method of measurement be adopted which shall furnish a basis for selection and improvement.

The red cattle of Flanders, H. RAQUET (*Ann. Gembloux, 24 (1914), No. 2, pp. 81–102, pls. 9*).—This is an account of the origin, development, distribution, body characteristics, and utility value of this breed of cattle.

[Cattle of northern Spain], J. R. CODINA (*Rev. Hig. y Sanidad. Vet. [Spain], 3 (1914), No. 10–11, pp. 627–723, figs. 31*).—A description and account of the breeds of cattle in the north of Spain.

Winter steer feeding, 1912–13, J. H. SKINNER and F. G. KING (*Indiana Sta. Bul. 167, popular ed. (1913), pp. 2–15*).—A popular edition of the bulletin previously noted (E. S. R., 30, p. 767).

Raising and fattening beef calves in Alabama, D. T. GRAY and W. F. WARD (*U. S. Dept. Agr. Bul. 73 (1914), pp. 11, pl. 1*).—Continuing cooperative work with the Alabama Station (E. S. R., 25, p. 72) a test was made with a herd of 80 cows, mostly grade Aberdeen-Angus, and headed by two Aberdeen-Angus bulls. From this herd 64 calves were raised during the year 1911. The calves were born during the spring months and ran with their mothers on pasture until late fall, when they were weaned and 49 prepared for the fattening period, which began January 17, 1912, and continued until April 1, 1912. The remaining 15 calves were retained for breeding purposes.

At 9½ months of age the average weight of the calves was 460 lbs.; the cost of raising each calf $14.36 or $3.12 per hundredweight. After 2½ months fattening they weighed 560 lbs., making an average daily gain of 1.37 lbs. per head. Each calf during the fattening period ate daily 4.4 lbs. of cotton-seed meal, 23.9 lbs. corn silage, and 2.76 lbs. broom-sedge hay. The cost per pound of gain was 7.31 cts., the cost per hundredweight to raise and fatten $3.61. The profit on the entire herd, crediting the calves retained for breeding purposes at $15 each, was $436.19, or an average of $6.81 for each calf.

Pig feeding, F. C. GRACE (*Jour. Dept. Agr. Victoria, 12 (1914), No. 1, pp. 44–50*).—Results of pig feeding experiments conducted at the Warrnambool Agricultural High School Farm are reported. Pollard and skim milk with a little bran was found to be the most economical ration under Australian conditions for pigs of all ages. Rape pasture reduced the cost of production.

A rotation of grazing crops for hogs (*Prog. Farmer, 29 (1914), No. 9, p. 286*).—There is outlined a combination of crops for the cotton belt which will furnish practically 12 months' grazing for hogs. Crops included are alfalfa, Melilotus, red clover, crimson clover, bur clover, cowpeas, soy beans, velvet beans, Spanish peanuts, Lespedeza, vetch, oats, wheat, barley, rye, chufas, sweet potatoes, and rape.

Management and breeding of horses, M. W. HARPER (*New York and London, 1913, pp. XIX+466, figs. 187*).—After discussing the judging, anatomy, and history of the horse, the author of this book treats of the various breeds of roadsters, saddle, and draft horses, ponies, the ass, and the mule. Methods of feed, care, and management are treated, together with chapters on horse training, harnessing, ailments, and stallion laws and regulations.

Whole world buying our fast horses (*Amer. Horse Breeder, 32 (1914), No. 7, p. 97*).—It is stated that it is only in the last 25 years that the foreign demand

for American trotting stallions, mares, and colts has assumed important proportions, and that the beginning of the present movement can be traced to the winning of the European championship by the American-bred mare Bosque Bonita at Vienna, in 1890. Since 1894, 63 stallions, together with 51 mares in the select 2.10 list, have gone abroad and most of them are now in the stud in Europe.

Austria has taken more of our 2.10 trotters than any other country, but the Russians have paid the highest prices and have acquired some of the greatest trotters ever foaled. It is thought that exports to Austia-Hungary number upward of 1,000 head. Italy has bought several prominent American stallions and mares. Germany is at present taking many high class trotters. France, Holland, Denmark, and other countries are occasional buyers of American breeding and racing stock. Australia and New Zealand are furnishing an extensive market at the present time.

The Welsh pony, Olive T. Dargan (*Boston, 1913, pp. XIII+52, pls. 24*).—This book furnishes an account of the origin, development, and qualities of the Welsh pony.

Poitou mule breeding (*Live Stock Jour. [London], 79 (1914), No. 2077, p. 81*).—This is an account of mule breeding operations at Poitou, France. The mares used are of northern origin, powerfully built, and heavy animals, with a height at the withers of from 15¼ to 16¼ hands, the head long and thin, the lips overhanging, the ears pointed and long, the neck and chest flat, the legs powerful, coarse and very hairy, and the color of the coat various. The best mares are mostly found in the moor districts of La Vendée and of the Department of Deux Sèvres, and are the result of improved breeding methods and the introduction of outside stock since 1860.

The jacks used have powerful heads, long and large ears, small eyes, and deeply built bodies, with round cruppers and coarse legs with small hoofs. A dark color is preferred; light coats and black muzzles are avoided. It is thought that jacks with long and curly hair produce better fleshing offspring than others. The breeding of jacks or "baudets" is limited exclusively to private studs in the district of Melle, in Poitou.

It is stated that the mule of Poitou is especially suited for heavy work. Its neck is broad and muscular, its back is straight, the chest broad and deep, the loins broad, the croup round, the legs very powerful with broad joints and small cylindrical hoofs. It stands from 14¼ to 15¼ hands high. Its hair is short, rough, and generally dark colored.

Studies on the physiology of reproduction in the domestic fowl.—VI, Double- and triple-yolked eggs, Maynie R. Curtis (*Biol. Bul. Mar. Biol. Lab. Woods Hole, 26 (1914), No. 2, pp. 55–83, figs. 4*).—Observations made on the frequency of the occurrence of double- and triple-yolked eggs, the relation of their production to the age of the bird, and the nature of the processes involved in their formation, are summarized as follows:

"During the last six years more than 3,000 different domestic fowls, which have been kept at least one year at the Maine Agricultural Experiment Station, have laid but three triple-yolked eggs. Each of these eggs was laid by a different individual and in each case the triple-yolked egg was one of the first eggs produced by a young pullet.

"Young pullets also show a decided tendency to produce double-yolked eggs when they first begin to lay. About 20 per cent of the pullets which lay before they are seven months old lay among their first eggs one or more with two yolks. Nearly 80 per cent of the individuals of the flock never lay a double-yolked egg. Mature birds also sometimes produce double-yolked eggs; but

most such birds have also produced one or more when they were young pullets. There has been no bird in the experiment station flock with which the laying of double-yolked eggs was 'habitual' although there are some which have produced several such eggs.

"The production of an egg with two or three yolks represents the extreme of rapid egg production, other forms of which are found in the production of two eggs united by a membranous tube; two eggs at the same time; two eggs at different times on the same day, and a daily egg production where the eggs are laid earlier on each successive day. The two yolks of a double-yolked egg may have all the egg envelopes in common, indicating that they have passed the entire length of the duct together; or each may possess one or more separate envelopes. There are also all the possible intermediate forms indicating that the two yolks in a common shell may unite at any point between the mouth of the funnel and the isthmus. When two eggs come together after the first has entirely passed the anterior end of the isthmus the result is the production of two eggs at the same time.

"Various disturbances of the processes of egg production may bring two yolks together in the oviduct. Double-yolked eggs evidently do not always represent simultaneous ovulations. The assumption is simultaneity or abnormally close succession of ovulations is necessary to account for the production of a succession of double-yolked eggs or of a double-yolked egg immediately following a long series of normal daily eggs.

"The double-yolked eggs contain more albumin and have a heavier shell than single-yolked eggs, and in triple-yolked eggs these parts are heavier than in double-yolked eggs. Yet these parts do not increase in direct proportion to the increase in the weight of yolk. That is, the percentage of albumin and shell is less in double- than in single-yolked eggs and is still smaller in triple-yolked eggs. The yolks of the multiple-yolked eggs of mature birds are not consistently smaller than the yolks of the normal eggs produced during the same period. Multiple-yolked eggs are longer in proportion to their breadth than the normal eggs of the same individual."

Previous studies have been noted (E. S. R., 26, p. 670).

The bacteriology of the hen's egg, with special reference to its freedom from microbic invasion, L. F. RETTGER (*Connecticut Storrs Sta. Bul. 75 (1913), pp. 191–213*).—Bacteriological tests were made of more than 10,000 eggs of different ages under various degrees of incubation.

Yolks from fresh eggs showed a positive test for bacteria other than *Bacterium pullorum* of 9.5 per cent. The yolks of artificially incubated eggs showed 2.75 per cent positive test during the first week of incubation, 1.3 per cent the second, and 3.6 per cent the third week.

The small percentage of positive results for eggs which have been incubated from 1 to 3 weeks is considered a noteworthy fact. A more exact method was employed in testing the yolks of fresh eggs and in this case the test was reduced to 3.86 per cent. It is believed that even this test is in all probability considerably above the actual figures, could accidental invasion of bacteria in the tests be entirely prevented. The tests with eggs incubated 1 and 2 weeks indicate that fertilized eggs do not become more subject to bacterial invasion of the yolk than the infertile.

In examinations of the whites of 582 eggs only 1.2 per cent gave positive bacteriological results, although many of the tests were made during the summer months. No *Bacterium pullorum*, the organism of white diarrhea, was detected in the white, although it was recovered from the yolks. Undoubtedly there was some contamination in these tests and it is believed to be safe to

say that the whites of fresh normal eggs are as a rule sterile. Fermentation tests made of the whites of 105 eggs for *B. coli* were negative. In noting the kinds of micro-organisms found in the yolks of fresh and incubated eggs it was observed that a large percentage in both cases were staphylococci, usually *Staphylococcus albus* or *S. aureus*, indicating that there was considerable contamination in the examination. Also the occurrence of a large number of members of the subtilis group would suggest the same thing.

The author reviews the results obtained by earlier investigators, which are not in harmony with those obtained in these tests. He suggests that the methods employed in making previous tests may have been at fault and that it is "highly improbable that normal fresh eggs contain bacteria and molds in such large proportions as various investigators have indicated." It is stated that the developing ova in the ovary of a laying hen are, as a rule, sterile unless the ovary is infected with the organism of bacillary white diarrhea. In 200 bacteriological examinations the author was unable to detect bacteria, molds, or other micro-organisms except *B. pullorum*. It is not thought possible that the blood is a source of infection, and examinations of the oviducts showed them as a rule to be sterile except at or near the cloaca. The views of Horowitz substantiate those of the author. It is believed that autosterilization of the oviduct is due to the following: (1) Phagocytosis, (2) mechanical action of the walls of the oviduct, and (3) bactericidal action of the secretions.

The success in preserving eggs with sodium silicate is cited as an indication that sound fresh eggs are as a rule sterile. The fact that many market eggs are decomposed is accounted for by their storage under unfavorable circumstances, i. e., filthy conditions and warm temperature and the fact that bacteria are given an opportunity to enter when the gelatinous coating is removed from the eggs during washing and handling.

Carbon dioxid in incubation. G. H. Lamson, jr. and H. D. Edmond (*Connecticut Storrs Sta. Bul. 76 (1914), pp. 219–278, figs. 13*).—The purpose of the investigation reported in this bulletin, which continues studies previously noted (E. S. R., 20, p. 472), was to determine the presence of carbon dioxid in natural incubation and the relative requirements as to ventilation and carbon dioxid during artificial incubation. A specially constructed incubation apparatus that would hatch eggs and at the same time allow for an accurate control of all factors was used. This experimental incubator consisted of four essential parts, the incubator, humidifier, gas meter, and air pump. Two commercial incubators were also used to determine the carbon dioxid in these types, and nests for sitting hens were prepared in such a way as to enable the drawing of samples of air from under the hen. The work extended over five years, nearly 10,000 eggs being used.

The results of these studies indicated that the chief source of carbon dioxid in incubation is the embryo, with the egg shell, hen, nest material, and room air as minor sources. After the third day the increase of carbon dioxid is proportionate to the increase in weight of the developing embryo.

The amount of carbon dioxid under sitting hens at the beginning of the period of incubation is much higher than for the room and increases to 50 or 60 parts in 10,000, while in the commercial incubators tested it increased to from 30 to 50 parts in 10,000. From this it appears that carbon dioxid is not a limiting factor in commercial incubation. However, ventilation is necessary in incubation in order to remove a portion of the respired carbon dioxid and prevent asphyxiation of the embryo. It was found that the normal embryo is able to withstand a wide variation of carbon dioxid during incubation. Little effect was noted on the percentage hatch where the carbon dioxid

occurred in from 30 to 60 parts per 10,000, but as the amount rises above 150 parts there is a marked decrease in the number of chickens hatched.

It is concluded that in all incubators carbon dioxid will be found, and that while its presence is not essential to successful incubation its occurrence up to 60 parts in 10,000 is not prejudicial to incubation. Factors influencing the amount of carbon dioxid in the egg chamber of an incubator are rate of ventilation, number of embryos, period of incubation, size of egg chamber, temperature, and carbon dioxid in the air of the incubator room.

Natural and artificial incubation of hens' eggs, H. M. LAMON (*U. S. Dept. Agr., Farmers' Bul. 585 (1914), pp. 16, figs. 3*).—This bulletin gives directions for the incubation of eggs, both natural and artificial; describes the several types of incubators; and discusses their selection and care.

The problem of moisture and ventilation requirements in incubation is discussed and the methods of testing eggs described.

Electro-cardiogram for embryo chicks, J. K. A. WERTHEIM-SALOMONSON (*Pflüger's Arch. Physiol., 153 (1913), No. 11–12, pp. 553–573, figs. 23*).—This article reports observations made of the electro-cardiogram of the embryo chick.

DAIRY FARMING—DAIRYING.

Dairying, J. P. SHELDON (*London, New York, Toronto, and Melbourne, 1912, pp. XII+465, pls. 33, figs. 21*).—A comprehensive book treating of the principal breeds of dairy cattle and the feeding, care, and management of dairy animals, and including chapters on soils and climates suitable for dairying, land and its betterment, manuring and treatment of soils, butter making, cheese making, and cooperative dairying in England.

Dairying in Nova Scotia (*Halifax, N. S., 1912, pp. 172, pls. 11, figs. 8*).—This is a reprint of the annual report of the Secretary of Agriculture of Nova Scotia for 1908, revised to date, and is a compilation of articles on general dairying topics, with special reference to Nova Scotian conditions.

[Dairy husbandry] (*Rpt. Dept. Agr. N. S. Wales, 1913, pp. 5, 7, 30–36*).—This report deals with the production and consumption of dairy products in New Zealand, the quality and price received for butter, oleomargarine competition, the cheese industry, and general dairy statistics.

[Dairy husbandry], T. L. HAECKER (*Minnesota Sta. Rpt. 1913, pp. 22–25, 30*).—From feeding trials conducted with dairy cows it appears that 11 lbs. of mangels or 9 lbs. of ruta-bagas are equivalent to 1 lb. of mixed grain, carrying about 10 per cent digestible protein with a nutritive ratio of 1:6 or such a mixture as would result from using equal parts of wheat bran and corn meal.

Studies made of the protein requirements of the animal body and for milk production have demonstrated the importance of long-time experiments. "The animal body can stand shortage of protein for several months, and then show the bad effect only to the trained observer. It was found necessary to continue the cows on low-protein diet for three years before it was possible to state the effect with certainty. When the change does come, it comes quickly, and the results are marked."

Manuring of grass land for milk and meat, B. F. DAVIS (*Field Expts. Harper-Adams Agr. Col. and Staffordshire, Rpt. 1913, pp. 4–7, fig. 1*).—In 1911, three plats of 3½ acres each were drained and treated with ground limestone at the rate of 15 cwt. per acre. Manures were applied as follows: Plat 1, superphosphate 2½ cwt. per acre; plat 2, superphosphate 2½ cwt. and sulphate of potash ½ cwt. per acre; and plat 3, no manure. During 1912 and 1913 the manurings were repeated.

Three lots of 2 cows each, equal in milk yield, period of lactation, etc., were maintained for 20 weeks on the respective plats and data kept on their production. Yearlings were added as the plats needed heavier pasturing and removed during light pasture. Data were collected on increase in weights, etc.

The total milk production for the two years' trials was for plat 1, 1,510 gal., plat 2, 1,489 gal., and plat 3, 1,168 gal. The total value of products, including milk and grazing, was £43 13s. 1d., £43 14s., and £31 16s. 11d. for the respective plats, while the net value per acre after deducting the cost of manures for plats 1 and 2 was £11 13s. 10d., £11 2s. 9d., and £9 1s. 9d., respectively.

Feeding of cattle on phosphatic pasture, C. Seltensperger (*Vie Agr. et Rurale, 2 (1913), No. 48, pp. 569, 570; abs. in Indus. Lait. [Paris], 39 (1914), No. 5, p. 91*).—The author records his observations in the feeding of cattle on phosphate-fertilized pastures. He concludes that such fertilizing favors the growth of the legumes and other flora rich in phosphorus content, that the phosphorus is more easily assimilated by the animal body in this form than when fed as bone meal and mineral phosphates, and that in turn the phosphorus content of the milk products is correspondingly increased.

Dairy herd records for fourteen years, J. H. Frandsen and A. L. Haecker (*Nebraska Sta. Bul. 139 (1914), pp. 3–30*).—In summarizing the herd records for the past 14 years at the Nebraska Station it is shown that the average production per cow was 7,020.8 lbs. milk and 341.71 lbs. of butter, which yield is nearly three times the amount produced by the average dairy cow of the State, and indicates the great increase that may be attained by proper breeding and feeding. The rations were made of Nebraska-grown crops and feeds, and the principal roughage was corn silage and alfalfa hay. The herd from a financial standpoint yielded a handsome profit during all the years of the test.

In studying the individual records it is noted that a large flow of milk is generally accompanied with a low milk fat test, while a small flow has a high milk fat test.

A new Holstein record (*Kimball's Dairy Farmer, 12 (1914), No. 6, p. 163, figs. 2*).—An account of a Holstein cow which at 3½ years produced 30.1 lbs. butter from 588.6 lbs. milk in 7 days; 123.88 lbs. butter from 2,522.2 lbs. milk in 30 days; at 4½ years 32.72 lbs. butter from 613.3 lbs. milk in 7 days; 135.31 lbs. butter from 2,632 lbs. milk in 30 days; at 5½ years 35.43 lbs. butter from 750 lbs. milk in 7 days; and 144.64 lbs. butter from 3,090.06 lbs. milk in 30 days.

It is stated that while these figures have not been officially authorized they are essentially correct.

Nourishment of young animals with self and foreign milk, W. Schrape (*Experimentelle Beiträge zur Ernährung tierischer Säuglinge mit arteigener und artfremder Milch. Inaug. Diss., Univ. Leipsic, 1912, pp. 82*).—In trials with lambs, young rabbits, and guinea pigs it was found that the value of the mother's milk is greater than of foreign milk, that mother's milk in the raw state is as healthful as the cooked, and that in the feeding of foreign milk to young animals it is advisable to heat the milk.

There are appended 87 references to works on milk feeding and milk hygiene.

The etiology of epidemic septic sore throat (*Jour. Amer. Med. Assoc., 62 (1914), No. 11, p. 853*).—Evidence is presented to show that "the cause of the infection in septic sore throat is the streptococcus which is discharged from the inflamed udder of the dairy cow into the milk, through which it is transferred to the throats of milk consumers." Animals suffering from garget are thought to be a frequent source of infection in man. It is pointed out, however, "that in addition to the primary infection of milk, pathogenic organisms may be accidentally introduced into it through its being handled by persons suffering from streptococcic infection."

Provision of the agricultural law relating to dairy products, 1913 (*N. Y. Dept. Agr. Circ. 88 (1913), pp. 1888–1914*).—This circular is a reprint of the laws relating to dairy products for the State of New York as revised to 1913.

Sanitary inspection of market milk, G. L. J. Gooren (*Hygienische Untersuchungen der Handelsmilch. Inaug. Diss., Univ. Bern, 1912, pp. 22*).—The author comments on the use of the freezing point of milk for detecting adulteration. It was found that the freezing point is not higher than —0.54° C. in normal whole milk and remains fairly constant. The thinning of milk lowers the freezing point, although the influence of thinning is not altogether regular. Homogenizing and sterilizing lowers the freezing point as does also a lower temperature, such as in pasteurizing. Hence the value of this method of detecting adulteration is uncertain.

The isoelectric point of man, cow, goat, dog, and guinea pig milk casein, A. Ylppö (*Ztschr. Kinderheilk., Orig., 8 (1913), No. 3, pp. 224–234; abs. in Zentbl. Physiol., 27 (1913), No. 22, p. 1202*).—The isoelectric point of various kinds of milk is given.

Electric sterilization of milk (*Sci. Amer., 110 (1914), No. 8, p. 155*).—It is stated that a process has been developed at the University of Liverpool for the electric sterilization of milk, consisting in a brief exposure to a high-tension electric current. The exact details of the method have not been made public. No difference in taste, aroma, or nutritive qualities could be detected between treated and untreated samples. Acidity did not increase; there was no coagulation; the heating was trifling; and all the pathogenic bacteria were killed.

Ozonization of milk, E. Wiener (*Abs. in Cream. and Milk Plant Mo., 2 (1914), No. 7, p. 18*).—This is a brief comment and description of a process for ozonizing milk which is claimed to be superior to pasteurization. The milk is atomized so fine as to constitute practically a vapor, and the ozone is produced by a high-tension electric current. After treatment the milk is collected in a vessel constructed for that purpose and compressed air is forced through, removing such small quantities of ozone as may remain after the treatment. It is said that the bacteria are destroyed without affecting the organic matter of the milk.

On the free fatty acids and the volatile fatty acids of fresh butter fat, A. Burr and H. Weise (*Molk. Ztg. [Hildesheim], 28 (1914), No. 16, pp. 291, 292*).—In a study made of the acidity of fresh butter fat it was found that the degree of acidity ranged between 0.6 and 1.4, expressed as tenth-normal alkali; that the lowest occurred in the month of October, the average and highest in May and April, respectively. There was no direct relation between the acidity of fresh butter fat and the content of water-soluble and water-insoluble volatile fatty acids. Butter samples of 2 and of 5 per cent salt content showed no variation in acidity over unsalted butter.

The Polenske number of fresh butter fat ranged between 1.12 and 3.1, the highest being in November and December, when the high water-insoluble volatile fatty acid content at this time is accounted for by the heavy feeding of beets. The Reichert-Meissl number also was highest during these two months.

The variability of Bacillus bulgaricus, E. Christeller (*Ztschr. Hyg. u. Infektionskrank., 77 (1914), No. 1, pp. 45–48*).—In studies made of *B. bulgaricus* it was found that this bacillus propagates rapidly after 24 hours in ordinary agar medium, but does not grow in milk agar. It grows practically as well on a sugar medium as upon bouillon. In milk it grows very poorly and remains in Gram-positive form. Coagulation of milk had no influence. Growth on agar caused it to lose its Gram-positive character.

The keeping quality of sweet cream butter (*Cream. and Milk Plant Mo., 2 (1914), No. 1, p. 21*).—Tests made by the Dairy Division of this Department

of sweet cream butter held in storage for a period ranging from 7 to 9 months are reported. The butter was made as prescribed by the Department from May 1 to August 20, from pasteurized cream containing not more than 0.234 per cent of acid for butter scoring 95 points, and had a water content of 13 per cent or less and a salt content between 2½ and 3¼ per cent. The butter was packed in hermetically sealed tins and stored at a temperature of zero or below.

For the 219 samples examined the average loss of points on scoring was approximately 2.5. The results show that for storage purposes butter made in this way has exceptionally good keeping qualities.

Preservation of butter by means of sodium bicarbonate and sodium nitrate, F. BORDAS (*Ann. Falsif., 7 (1914), No. 63, pp. 45–49; abs. in Jour. Soc. Chem. Indus., 33 (1914), No. 4, p. 214*).—"The results of an investigation, in which quantities of 100 gm. of butter were mixed with 0.857 gm. of sodium bicarbonate or with this quantity of bicarbonate and 0.143 gm. of sodium nitrate, and then kept for 14 days, showed that, although the alkali prevented the acidity of the butter from increasing, it modified the color and taste. The addition of the sodium nitrate was without effect."

Nut butter (*New Zeal. Dairyman, 18 (1914), No. 5, p. 24*).—Attention is directed to the increased consumption of nut butter. At first coconut oil only was used in its manufacture, but now other substances, such as peanut oil and palm-kernel oil are employed. It is stated that nearly 50,000 tons are produced in England each year and that the consumption overtakes the supply.

The ripening of mold cheeses and the ferments involved therein, P. MAZÉ (*Jour. Agr. Prat., n. ser., 27 (1914), No. 2, pp. 44–47*).—A description is given of the ripening process of such cheeses as Camembert, Brie, and Coulommier, together with notes on the different groups of organisms involved in the production of desirable flavors. The necessity of controlling the ripening process and especially of eliminating undesirable organisms is emphasized.

Oleomargarine, H. VAN VOORNVELD (*Die Margarine. Trier, Germany, pp. 131, pls. 2, figs. 33*).—A complete treatise on the manufacture of oleomargarine, butter, and cheese.

Bibliography of references on milk and milk products received during 1912, C. HUYGE (*Ann. Sta. Agron. Etat Gembloux, 2 (1913), pp. 253–352*).—The 757 references in this bibliography are classified under the following headings: (1) Milk: Production, city supply; hygiene; abnormal milk; diseases of the udder; influence of feeding on the milk and its products; milk of man, sheep, and goats, milk products and substitutes, chemistry of milk; adulterants and preservatives; bacteriology; and ferments. (2) Butter and cheese: Production; chemistry and bacteriology. (3) Milk trade and statistics.

There are included indexes to authors and to publications.

VETERINARY MEDICINE.

Report of the veterinary director general for the year ending March 31, 1913, F. TORRANCE (*Rpt. Vet. Dir. Gen. Canada, 1913, pp. 110, pls. 4*).—Following the main part of this report (pp. 3–29), which consists of a general account of the work of the year, 13 appendixes are presented among the more important of which are the report of the pathologist (pp. 67–73), by C. H. Higgins; report of the pathologist in charge of the veterinary research laboratory at Agassiz, British Columbia, including protocols on the work with hematuria; Notes on the Life History of *Dermacentor venustus*, and a note on the *Ornithodoros megnini* collected on jack rabbits at Lethbridge, Alberta (pp. 74–80), by S. Hadwen; report of the pathologist in charge of the veterinary

research laboratory at Lethbridge, Alberta, including an account of laboratory work and field investigations in connection with outbreaks of dourine and preliminary studies and experiments with swamp fever (pp. 81–87), by E. A. Watson; Special Report on Contagious Abortion (pp. 88–92), by F. Torrance; and The Serum Reactions and Serum Diagnosis of Dourine (pp. 102–108), by E. A. Watson.

Report of the territorial veterinarian for the biennial period Jan. 1, 1911, to Dec. 31, 1912, V. A. Nörgaard and L. N. Case ([*Bien.*] *Rpt. Bd. Comrs. Agr. and Forestry Hawaii, 1911–12, pp. 160–220, pls. 8*).—This report deals with the occurrence of diseases of live stock, tuberculin testing in dairy herds in the city and county of Honolulu, the intradermal tuberculin test, glanders in the Territory, the intradermal mallein test, a peculiar disease among sheep on the island of Lanai, etc.

Annual report by the chief veterinary officer for the year 1912, S. Stockman (*Bd. Agr. and Fisheries* [*London*], *Ann. Rpt. Chief Vet. Off., 1912, pp. 41*).—This report first discusses in detail the outbreaks of foot-and-mouth disease which occurred in 1912 (pp. 3–36), then, briefly, the occurrence of hog cholera, glanders, and anthrax.

Annual report of the Bengal Veterinary College and of the Civil Veterinary Department, Bengal, for the year 1911–12, F. Raymond and A. Smith (*Ann. Rpt. Bengal Vet. Col. and Civ. Vet. Dept., 1911–12, pp. 5+7+VIII+2+3*).—The first section includes reports on the epizootic diseases department in Calcutta and its vicinity and of the Raymond Research Laboratory. The second section deals with veterinary instruction, the occurrence and treatment of diseases, breeding operations, etc.

Annual report on the civil veterinary department, Burma, for the year ended March 31, 1913, G. H. Evans (*Ann. Rpt. Civ. Vet. Dept. Burma, 1913, pp. 3+13, pl. 1*).—This, the usual annual, report deals with veterinary instruction, occurrence and treatment of animal diseases, breeding operations, etc.

Veterinary diseases, A. Balfour, R. G. Archibald, et al. (*Rpt. Wellcome Research Labs. Gordon Mem. Col. Khartoum, 4 (1911), Sup., pp. 395–404*).—This is a review of progress in work with diseases of animals, including rinderpest, horse sickness, bovine pleuro-pneumonia, etc.

Practical bacteriology, microbiology, and serum therapy, A. Besson, trans. by H. J. Hutchens (*London, New York, and Bombay, 1913, pp. XXX+892, figs. 416*).—A translation and adaptation from the fifth French edition of the work, the second edition of which has been previously noted (E. S. R., 13, p. 889).

A compend of parasitology, E. Brumpt (*Précis de Parasitologie. Paris, 1913, 2. ed., pp. XXVIII+1011, pls. 4, figs. 698*).—This is a revised and enlarged edition of the work previously noted (E. S. R., 24, p. 479).

Investigations of scabies and scab mites, particularly scabies of the chamois, J. Fiebiger (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 14 (1913), No. 6, pp. 341–365, figs. 8*).—This paper includes a discussion of the pathology and pathological histology of the disease; location of the mites; other forms of scabies, including that of the capybara (*Hydrochœrus capybara*), rabbit, and fowl; transmission experiments; and biological studies.

The author finds that the goat can be artificially infected with the chamois mite, a variety of *Sarcoptes scabei*, and that it may be spontaneously transmitted to other goats. Thus it appears that a natural transmission of scabies from chamois to goats is likewise possible. A spontaneous transmission of this mite to sheep does not appear to take place.

Chemotherapy, P. Ehrlich (*Nature* [*London*], *91 (1913), No. 2285, pp. 620–626*).—An address delivered before the Seventeenth International Congress of

Medicine at London on August 8, 1913, which deals especially with the work of the author and others engaged in the same line of research.

The relation of the leucocytic bacteriolysin to body fluids, W. H. MANWARING (*Abs. in Science, n. ser., 38 (1913), No. 978, p. 453*).—It is pointed out that a substance can be extracted from the leucocytes of the horse which, when dissolved in distilled water, is strongly bactericidal. When dissolved in physiological salt solution it also possesses considerable bactericidal power, but when mixed with sera, cerebro-spinal fluid, products of tissue, or leucocyte autolysis, it is without bactericidal power.

It is stated that the antibactericidal action of body fluids and tissue products depends upon three factors: "(1) The antibactericidal power of the colloids they contain, (2) the antibactericidal power of their neutral salts and other neutral diffusible components, and (3) the antibactericidal power of their diffusible alkalis. Diffusible acids are apparently without antibactericidal effect. An extract from horse leucocytes can have little or no antiseptic action when injected into body cavities and tissue spaces."

Toxic action and disinfecting agents, H. KÜHL (*Chem. Ztg., 37 (1913), No. 12, pp. 113–115*).—This is a discussion of the methods used at the present time for determining the toxicity of certain disinfecting agents against bacteria and other micro-organisms. It is pointed out that in certain concentrations disinfectants act as stimulators of growth.

Technical errors in protective vaccination, S. LAUFER (*Állatorvosi Lapok, 36 (1913), No. 12, pp. 139–143; abs. in Berlin. Tierärztl. Wchnschr., 29 (1913), No. 36, p. 645*).—This is a criticism of some of the preparatory and vaccination methods utilized at the present time for immunizing animals.

Synthetic antigens for the meiostagmin reaction when used for malignant growths, G. IZAR (*Wiener Klin. Wchnschr., 25 (1912), No. 33, pp. 1247, 1248; abs. in Centbl. Bakt. [etc.], 1. Abt., Ref., 56 (1913), No. 17, pp. 520, 521*).—On successively precipitating pancreas antigens in a methyl alcoholic solution with acetone, ethyl alcohol, ether, benzol, and petroleum-ether, the preparation obtained was found not to be any more stable than the original crude methyl alcohol extract. The crude extract is insoluble in acetone and the purified product is soluble.

The following antigens, prepared with myristic acid according to E. Fischer's method, were found utilizable in the test: Witte peptone, albumose from Witte peptone, albumose from trypsin digestion and also from pepsin digestion of calf's pancreas, edestin, casein, elastin, and kyrin. Instead of myristic acid, oleic and palmitic acids obtained from the fats of the pancreas, from human sarcomas, carcinoma, and from cacao butter can be employed. Which of these compounds is preferable from the standpoint of stability and the number of positive results obtained, the author was unable to say.

Complement fixation obtained with the purified antigen and with all the combinations mentioned above was as marked with inactivated normal serum as with the sera obtained from subjects affected with tumors. By bringing together blood serum with some of the synthetic antigens hemolytic substances were produced in large amounts. The tumor sera furnished the greatest amount of these substances.

An improvement in the meiostagmin reaction, R. KÖHLER and A. LUGER (*Wiener Klin. Wchnschr., 25 (1912), No. 29, pp. 1114, 1115; abs. in Centbl. Bakt. [etc.], 1. Abt., Ref., 56 (1913), No. 3, pp. 77, 78*).—The principal purpose of this work was to find a method for preparing more stable extracts of the organs used in the test. Tests with aqueous and alcoholic solutions of lecithin and cholesterol yielded unsatisfactory results, while an extract prepared from lecithin in a finely divided state from various sources and obtained by extracting

the preparation for 24 hours with acetone at a temperature of 50° C. and then filtering the extract through paper gave good results. The extract obtained was diluted with water, and the technique followed was that described by Ascoli.

The results of some tests with the sera of normal subjects and subjects affected with tumors and other diseases are given.

Autoserotherapy in pleuritis, P. Haan (*Rev. Gén. Méd. Vét., 21 (1913), No. 251, pp. 621–625; abs. in Berlin. Tierärztl. Wchnschr., 29 (1913), No. 35, p. 628*).—Although the application of the autoserotherapeutic method for serofibrinous pleuritis is not new, it seems to be very little used by the practicing veterinarian. In addition to the classical methods which use caffein, digitalis, and other diuretics, and vesicants, the author used autoserotherapy directly after the fluid was drawn from the thoracic cavity as suggested by Teppay (E. S. R., 26, p. 684). The day following the administration of the thoracic fluid, improvement usually set in, which manifested itself by a restoration of the appetite.

A considerable amount of fluid must be withdrawn from the thoracic cavity because 40 cc. must be injected in the subcutaneous tissues of the same animal. The dose may be repeated if a reaccumulation of the fluid in the cavity takes place. If the method is used early, almost two-thirds of the horses affected may be saved.

A dry placenta powder and its use in Abderhalden's dialysis method for diagnosing pregnancy, V. L. King (*München. Med. Wchnschr., 60 (1913), No. 22, pp. 1198; abs. in Berlin. Klin. Wchnschr., 50 (1913), No. 26, p. 1227*).—A preparation designed for use in the dialysis method (E. S. R., 28, p. 777) instead of the wet placenta protein.

The biological diagnosis of pregnancy, E. Engelhorn (*München. Med. Wchnschr., 60 (1913), No. 11, pp. 587, 588; abs. in Berlin. Tierärztl. Wchnschr., 29 (1913), No. 26, p. 472*).—The dialysis method was studied with human sera. The conclusion drawn is that a reaction does not warrant the diagnosis that the subject is pregnant.

The serum diagnosis of pregnancy, C. C. W. Judd (*Jour. Amer. Med. Assoc., 60 (1913), No. 25, pp. 1947, 1948*).—A very general description of the test previously discussed (E. S. R., 27, p. 577), with a statement in regard to the satisfactory results obtained by its use.

The serodiagnosis of pregnancy, K. Jaworski and Z. Szymanowski (*Wiener Klin. Wchnschr., 26 (1913), No. 23, pp. 922–924; abs. in Berlin. Klin. Wchnschr., 50 (1913), No. 26, p. 1227*).—The Abderhalden method, when conducted strictly in accordance with the rules set down by the originator, gave satisfactory results in every instance. It was positive in the early days of pregnancy and it was still present 14 days after parturition. In extra-uterine pregnancy the reaction was positive when the ectodermal plates were still in contact with the reproductive system. In hyperemesis or eclampsia (women) the reaction was generally very faint. Sera from subjects suffering with carcinoma did not cleave placenta protein.

The diagnosis of pregnancy with the optical method and the dialysis procedure, R. Freund and C. Brahm (*München. Med. Wchnschr., 60 (1913), No. 13, pp. 685–690*).—This is a study of the value of both the optical and the dialysis method. In all there were 135 cases examined, and 6 of these were eclampsia cases and examined twice. The optical method was tried 134 times and the dialysis method 99 times. The subjects were normal pregnancies, extra-uterine pregnancies, adnex tumors, and other nongravid cases.

The clinical findings were parallel with the optical method in 97 out of 134 cases (72.4 per cent), and with the dialysis method in 66 out of 99 cases (66.7

per cent). The reason that varient results were obtained with the optical method lies principally in the inability of the sera to produce a uniform cleavage of the peptone at different times, since some protective ferments will cleave a certain kind of peptone while others will attack this peptone only slightly. In the dialysis method, dialysis thimbles were used. The method was controlled by the optical procedure 92 times and conducted 7 times alone. Agreement was noted in 61 cases, 43 positive and 18 negative, showing that the results from 31 cases did not harmonize. A very high cleavage power was noted with the sera of eclamptic patients.

Experiences with the Abderhalden pregnancy reaction (dialysis procedure and ninhydrin reaction). H. SCHLIMPERT and J. HENDRY (*München. Med. Wchnschr., 60 (1913), No. 13, pp. 681–685; abs. in Chem. Abs., 7 (1913), No. 13, p. 2242*).—The findings of Abderhalden were verified in 79 cases, of which 40 were absolute cases of pregnancy. In all cases of pregnancy the reaction was positive and the rest of the sera gave negative reactions.

"A total of 316 cases were examined but not with satisfactory results until all the important points in the technique had been worked out. Especially significant was the fact that placenta not blood-free gave inaccurate results. For washing the placenta tissue sodium chlorid below 0.5 per cent proved undesirable; above this concentration to 0.9 per cent the blood was readily removed and clear white placenta tissue was obtained. The procedure finally adopted was to wash out the placenta tissue with 0.9 per cent sodium chlorid until colorless, then wash 10 minutes in running tap water to remove the sodium chlorid, and proceed further as directed by Abderhalden. Other less important details of the technique are discussed."

Abderhalden's reaction with placenta and serum. H. SCHLIMPERT and E. ISSEL (*München. Med. Wchnschr., 60 (1913), No. 32, pp. 1758–1760; abs. in Berlin. Tierärztl. Wchnschr., 29 (1913), No. 37, p. 665*).—The tests were conducted with the object of determining whether animals during the period of pregnancy developed certain ferments and to elicit to what extent the ferments are specie specific. It was considered of great importance in the investigations to separate sharply the fetal and maternal parts of the placenta in order to get a substrat which was subject to better control. From theoretical considerations it was also deduced that a migration of chorion villi in the blood stream of the mother is without reasonable foundation. For the tests sheep and horse placentas were used.

Ferments were noted in the blood stream which were not only specific for homologous placenta protein but also for the heterologous protein, e. g., the strongest serum was from man and its action was stronger for horse protein than for human placenta protein. Sheep serum also acted more strongly on horse protein than on sheep placenta protein. The fetal as well as the maternal parts of the placenta were cleaved.

Serology of eclampsia. B. STANGE (*Zentbl. Gynäkol., 37 (1913), No. 9, pp. 298–300; abs. in Jour. Amer. Med. Assoc., 60 (1913), No. 14, p. 1117*).—Abderhalden's reaction for pregnancy was found especially intense with an eclamptic placenta obtained from a woman. The changes in the blood in eclampsia are similar to those of a normal pregnancy.

Abderhalden's dialysis method, a means of determining whether or not a cow is in a new period of lactation. H. FALK (*Berlin. Tierärztl. Wchnschr., 29 (1913), No. 8, pp. 129–132*).—The author gives his experience with the Abderhalden dialysis method (E. S. R., 28, p. 777), which was previously proposed for diagnosing pregnancy. It was found that the blood contained proteolytic enzyms 21 days after calving, and in some cases on the twenty-third

day. Apparently positive reactions were obtained some days later than the twenty-third.

The method is considered essentially a laboratory method, and can not be used by the average veterinarian unless he has good laboratory facilities.

Some tests made by E. Abderhalden are also included in the data.

Valuation of precipitating anthrax serum, W. RICKMANN and K. JOSEPH (*Berlin. Tierärztl. Wchnschr., 29 (1913), No. 33, pp. 591–593*).—It is shown that a standard antigen made from diseased organs is not necessary for the valuation of precipitating anthrax serum. For this purpose the authors propose the use of bacterial extracts in which a determination is made of the total solids or dry substance. The total solids were found to be an index as to the amount of precipitating substances present.

Symptomatic anthrax and diseases resembling it.—I, (a) Symptomatic anthrax, F. WULFF (*Deut. Tierärztl. Wchnschr., 20 (1912), Nos. 40, pp. 609–614; 41, pp. 625–629*).—It is shown that blackleg occurs with and without pathologic changes in the muscle tissue. A suspicion of blackleg may be awakened if the cadaver emits the characteristic rancid or rancid acid odor, or by the presence of a spleenic tumor, liver spots, pleuritis, and serofibrinous pericarditis. A microscopic examination of the original material hardly ever presents anything which is characteristic, and consequently a test of this kind is of no practical value for diagnostic purposes. A diagnosis is only certain with the cadaver when the pathologic process is more or less extensive in nature and the changes are not related in any way to some disease of the productive system.

Blackleg may be suspected (a) if small, apparently unimportant, blackish red, dry or wet patches of diseased muscle are present, (b) by external hemorrhagic infiltration of the muscle, or (c) by the same findings in the organs.

Blackleg and diseases resembling symptomatic anthrax.—II, (b) Diseases resembling symptomatic anthrax, F. WULFF (*Deut. Tierärztl. Wchnschr., 20 (1912), No. 45, pp. 689–693*).—A discussion of the author's findings with cases which, in many respects, resembled blackleg. In some instances bacteria were isolated which at first sight appeared to be the typical *Bacillus anthracis symptomatici*; consequently the process of diagnosing cases of symptomatic anthrax must be carefully conducted, and such aids as serum tests and animal experiments must be utilized.

Diagnosis of blackleg by examining the bile, III, F. WULFF (*Deut. Tierärztl. Wchnschr., 20 (1912), No. 46, pp. 705–709; abs. in Centbl. Bakt. [etc.], 1. Abt., Ref., 56 (1913), No. 12, p. 367*).—Out of 30 cases, undoubtedly symptomatic anthrax, the causative organism was noted 18 times in the bile, and in the remaining subjects the edema bacillus was observed. By injecting the muscle tissue from these 30 animals into guinea pigs, the typical symptoms of blackleg were produced in every case, consequently at the present state of our knowledge the bile is of no absolute value for diagnosing the presence of this disease.

Additional data in regard to the precipitation diagnosis in tuberculosis, F. MORELLI (*Ann. Ist. Maragliano, 6 (1912), No. 4, pp. 290–297; abs. in Ztschr. Immunitätsf. u. Expt. Ther., II, Ref., 6 (1913), No. 15, pp. 1107, 1108*).—As a continuation of previous work (E. S. R., 28, p. 377) the results of examining 46 sera by the precipitation method are reported. It is believed that the method is a satisfactory one for diagnosing tuberculosis.

The intradermal reaction in bovines, M. DALKIEWICZ (*Przegl. Weterynarski, 27 (1912), Nos. 5, pp. 195–199; 6, pp. 228–237; abs. in Ztschr. Immunitätsf. u. Expt. Ther., II, Ref., 6 (1913), No. 15, p. 1063*).—The reaction is deemed a good one, especially as a repetition will always give the same result.

Is tuberculin nontoxic for the healthy organism? P. GEIBEL (*Ztschr. Hyg. u. Infektionskrank., 73 (1912), No. 1, pp. 13–30; abs. in Centbl. Bakt. [etc.], 1. Abt., Ref., 56 (1913), No. 7, pp. 212, 213*).—The author states that the question as to the therapeutic value of tuberculin for human medicine and its value as a diagnostic agent in veterinary medicine has been decided in favor of tuberculin. On the other hand, very little is known about the toxic effect of tuberculin upon the healthy organism and very divergent views have been presented in this direction.

The author studied this problem with some tables placed at his disposal by Landmann. He believes that Koch's tuberculin can not be used for determining the effect of this product on the organism, since it contains in large amounts substances which are nonspecific such as glycerol and beef extract. With Landmann's tuberculin, however, the interfering factors are not present, and as a result of work with it he concludes that tuberculin to some extent affects the healthy organism. No grounds exist for believing that the toxin of the tubercle bacillus possesses only a relative toxicity.

The relation of bovine tuberculosis to human tuberculosis, B. MÖLLERS (*Arch. Wiss. u. Prakt. Tierheilk., 39 (1913), No. 4–5, pp. 465–472*).—The author recognizes three types of tubercle bacilli, namely, human, bovine, and avian. He believes that all measures for preventing this disease must be directed against both the human and bovine sources of the malady. The most probable source of infection in man is from man.

Tuberculosis of food animals and its relation to the public health, W. JOWETT (*Agr. Jour. Union So. Africa, 5 (1913), Nos. 1, pp. 89–99; 2, pp. 205–214*).—A discussion of the causes of the disease, symptoms, udder tuberculosis, the post-mortem appearances in tuberculosis, the tuberculin test and its limitations, the methods of controlling tuberculosis, sanitation, relation of animal tuberculosis to public health, sterilized and pasteurized milk, tuberculosis from the standpoint of meat inspection, and tuberculosis of swine.

Tuberculosis of the tonsils in a heifer, P. CHAUSSÉ (*Bul. Soc. Cent. Méd. Vét., 90 (1913), No. 16, pp. 313–316*).—A description of a case of primary tuberculosis in the tonsils of a cow.

Tuberculous orchitis in a horse, C. DARMAGNAC (*Bul. Soc. Cent. Méd. Vét., 90 (1913), No. 16, pp. 316–318*).—A description of a case in an 8-year-old stallion. After ablation of the testicles the animal, so far as could be noted by clinical signs, returned to its normal condition.

Concerning the pure cultivation of Bang's bacillus, A. ASCOLI (*Ztschr. Hyg. u. Infektionskrank., 75 (1913), No. 1, pp. 172–184, fig. 1*).—This relates to the biology of *Bacillus abortus*.

Addresses to the general assembly on tick eradication (*South Carolina Sta. Circ. 24 (1914), pp. 35*).—This circular presents addresses delivered by E. M. Nighbert, A. F. Lever, W. M. Riggs, and B. H. Rawl, respectively, before the general assembly of South Carolina on January 26, 1914, urging the advisability of an appropriation to be used in ridding the State of the Texas fever tick.

Onchocerca gibsoni: The cause of worm nodules in Australian cattle, J. A. GILRUTH and GEORGINA SWEET (*Rpt. Austral. Assoc. Adv. Sci., 13 (1911), pp. 316–345, pls. 17*).—Previously noted from another source (E. S. R., 26, p. 183). See also another note (E. S. R., 28, p. 680).

Anthrax in hogs, with a contribution to the Ascoli anthrax precipitation reaction, E. SEIBOLD (*Ztschr. Fleisch u. Milchhyg., 23 (1913), No. 7, pp. 150–153*).—A description of the findings with the spleen, appendix, kidney, and bladder of a pig which died presumably of acute hog cholera, although some of the pathologic lesions pointed to the presence of hog erysipelas. The animal was fed on beet tops and leaves.

In the small nodules present in the spleen anthrax bacilli were detected, and the findings were verified by plating and animal tests. Precipitation tests were then made with the regular extract prepared according to the Ascoli procedure and with a chloroform sodium chlorid extract. The precipitating sera used were those of Ascoli, and Schütz and Pfeiler. With extracts made with the pulp of the spleen no reaction was obtained, but with those made from the nodules present in the spleen, a positive reaction resulted.

Investigations in regard to thermoprecipitation for detecting hog erysipelas, K. GAUSS (*Untersuchungen über die Thermopräzipitation zum Nachweis des Schweinrotlaufs. Inaug. Diss., Tierärztl. Hochsch. Stuttgart, 1912; abs. in Centbl. Bakt.* [*etc.*], *1. Abt., Ref., 56 (1913), No. 22, p. 679*).—The precipitation method is deemed satisfactory for detecting erysipelas in hogs. The specific reaction occurs instantaneously, or at least in from 2 to 3 minutes, when extracts of the kidney or heart are used. It takes a somewhat longer time with extracts of the spleen, liver, muscle, skin, and lung. The method of preparing these extracts has very little effect upon the reaction nor does it make very much difference whether fresh or putrefied material is used. When the specimens, organs, etc., have been conserved in alcohol or formaldehyde, the reaction is not affected, but glycerol affects the reaction somewhat, and a solution of Septoform or corrosive sublimate can not be used for preserving the diseased organs. Drying and heating the material to 130° C. have no effect upon the reaction.

In conducting the test it is always necessary to have a fresh antiserum.

Have reliable observations been made in regard to the spread of hog epizootics through protectively vaccinating against erysipelas? JAKOB ET AL. (*Abs. in Berlin. Tierärztl. Wchnschr., 29 (1913), No. 36, p. 653*).—Hog cholera occurred from 10 to 12 days after vaccinating against erysipelas in 3 establishments where the animals were treated by the same veterinarians. In the first establishment, which contained 22 hogs, 20 were vaccinated and the other 2 were segregated but not vaccinated. All of the vaccinated animals died 10 days following the vaccination. On necropsy it was found that some of the hogs were affected with a septic form of plague, i. e., hog cholera, and the others with acute swine plague; and in another group chronic hog cholera was noted. The two segregated animals not vaccinated were then slaughtered and found to be affected with chronic hog cholera.

In the second establishment, containing 30 hogs, the animals also died from 10 to 12 days after vaccination. Here also the diseases mentioned above were noted on necropsy. The hogs of the third establishment behaved in a similar manner.

The above cases were treated with Gans's serum and cultures for vaccination purposes. Other experiences of the same kind are also reported by Ziegart, Fritsch, Kussman, and Ott.

Testing the vaccinating substances against swine plague, and some investigations with bacteria killed by heat, F. DÜERKOP (*Prüfung der Impfstoffe gegen Schweineseuche nebst Untersuchungen über die Immunisierung mit thermisch abgetöteten Bakterien. Inaug. Diss., Tierärztl. Hochsch. Hannover, 1912; abs. in Berlin. Tierärztl. Wchnschr., 29 (1913), No. 36, pp. 644, 645*).—The vaccinating substances examined included (1) sera, (2) bacterial extracts, and (3) vaccines or curative lymphs. Among the sera the polyvalent variety seemed to give the best results. Klett and Braun's sera was especially satisfactory. The bacterial extracts (Gans, Schreiber, Rheinisch Serum Company, Piorkowski, Suptol-Burow, and Kraft's vaccine), while prepared by different methods and various strains of organisms, have some characteristics in common.

The author prefers bacteria killed by heat to bacterial extracts, as the former yield a more active and lasting immunity.

Vaccines (Höchst's vaccine, Gans and Schreiber extracts, and porcin), are suspensions of swine plague bacteria. In all probability these organisms are killed according to Wright's directions for preparing vaccines by heating them to about 60° C. With some of the lymphs, however, the bacteria, in addition to being treated in this manner, are disintegrated by special methods, while others have an addition of swine plague serum, which is added for the purpose of aiding in the solution of the organism after injection into the animal and for the purpose of preventing a negative phase. The Euman lymph also has an addition of swine plague bacilli.

Mammary botryomycosis in the mare, W. PLÖTNER (*Monatsh. Prakt. Tierheilk., 23 (1912), No. 6–7, pp. 279–304, pl. 1, figs. 2; abs. in Vet. Rec., 26 (1914), No. 1338, p. 559*).—"Early extirpation of the mammary gland is the best treatment for botryomycosis of the udder. Iodids are not advisable as agents for curative treatment, as the tumor, which is fibrous and not well supplied with blood vessels, is but little influenced by their internal administration. Iodid of potassium, however, may be used in small and recent botryomycotic tumors, and is also serviceable before and after the operation of extirpating the mammary gland. Before the operation it disperses the phlegmonous swelling surrounding the botryomycotic tumor, and thus facilitates surgical interference. Afterwards it encourages the absorption of postoperative edemas and swellings."

A bibliography of 42 titles is appended.

In regard to protectively vaccinating against the pectoral form of equine influenza (Brustseuche), D. KONEW (*Berlin. Tierärztl. Wchnschr., 29 (1913), No. 33, pp. 589–591*).—In order to determine the immunizing properties of blood containing the specific micro-organism isolated by the author, tests were made with 80 sound horses present in a stable in which there were horses affected with equine influenza. The injection was given subcutaneously in the side of the neck in amounts ranging from 1 to 2 cc., the dose given being gauged according to the size and age of the animals. Following the injection the animals were not worked for 3 days and only one-third of the time for the next 4 days.

None of the horses vaccinated became sick. On the other hand, the disease occurred continually in other horses which were apparently sound at the time the group was vaccinated.

Following the above experiments vaccinations were made in the field and in regions where outbreaks occurred, and to date about 667 animals have been successfully treated.

About protective and curative vaccination for the pectoral form of equine influenza, BROMBERGER (*Berlin. Tierärztl. Wchnschr., 29 (1913), No. 33, p. 591*).—A description of cases of the disease treated with Pfeiler's vaccine and serum, serum alone, or with Bengen's Ozonal. The results obtained were satisfactory.

Nematodes of the genus Acuaria Brems. (Dispharagus Duj.) parasitic in domestic fowls, A. HENRY and P. SIZOV (*Arch. Vet. Nauk [St. Petersb.], 43 (1913), No. 7, pp. 609–637, pls. 9; abs. in Rev. Gén. Méd. Vét., 23 (1914), No. 270, pp. 303–306*).—A report of systematic and biological studies. A bibliography of 58 titles is appended.

Parasitism in relation to birds, H. V. JONES (*Zoologist, 4. ser., 18 (1914), No. 206, pp. 41–53, pl. 1*).—This paper deals chiefly with the Cestoda, Acanthocephala, and Nematoda found in the alimentary canal of some of the common birds. A table is given which shows the month, locality, food of bird, and position of the parasite when found. A list is also given of 24 species of birds ex-

amined, showing the average number of ectoparasites and endoparasites per individual.

Thirty-two per cent of the birds were found to be infested by cestodes and 25 per cent by nematodes.

RURAL ENGINEERING.

[Agricultural engineering] (*Agr. Student, 20 (1914), No. 5, pp. 345, 346, 350–352, 355–365, figs. 6*).—Special articles on agricultural engineering are included as follows: Agricultural Engineering as a Profession, by J. B. Davidson (pp. 345, 346); Fresh Water Systems, by S. E. Brown (pp. 350–352); Farm Implements, by W. E. Taylor (pp. 355–358); The Place of Agricultural Engineering in the Agricultural College Curriculum, by P. S. Rose (pp. 358, 359); Farm Lighting Plans, by J. P. Stout (pp. 360–362); and The Harvester Expert—His Training and Work, by C. O. Reed (pp. 363–365).

Rural engineering (*N. Cong. Internat. Agr. Gand, 1913, Compt. Rend., pp. 261–291*).—This section reports the rural engineering proceedings at this congress (E. S. R., 29, p. 101).

Water conservation and irrigation (*Off. Yearbook Aust., 6 (1901–1912), pp. 569–583, fig. 1*).—Statistical data are given regarding water supply works, including the development of artesian supplies, and irrigation systems of Australia.

The wet lands of southern Louisiana and their drainage, C. W. Okey (*U. S. Dept. Agr. Bul. 71 (1914), pp. 82, pls. 4, figs. 19*).—This bulletin, intended for land owners, engineers, and others interested in drainage by pumping, especially in the wet prairies along the Gulf coast, includes all the salient features of the information so far published on this subject (E. S. R., 24, p. 287), and gives also the results of later investigations.

A description of general conditions in the Gulf coast section of Louisiana is followed by a statement and brief consideration of some of the larger drainage problems encountered, and emphasizing the need of more complete cooperation between various interested parties in the study and solution of such problems. The results of detailed examinations of a number of drainage districts reclaimed or in process of reclamation are reported with a summary of such results. The bulletin closes with a consideration of the problems involved in land drainage by means of pumps in Louisiana, which is a continuation of work previously reported (E. S. R., 26, p. 589).

Better roads, E. T. Tannatt (*Mont. Farmers' Bul. 2, pp. 29, pls. 3, fig. 1*).—This is a popular discussion of the general factors entering into and affecting the good roads problem in Montana.

Forest road construction, H. Stoetzer (*Waldwegebunkunde. Frankfort on the Main, 1913, 5. ed., pp. 251, pls. 3, figs. 112*).—This is a reference book for engineers in charge of the design, location, construction, and maintenance of forest roads. The three main divisions are (1) the location and design of forest roads; (2) construction, maintenance, and cost; and (3) forest railroads and cable roads.

The cause and the prevention of cracking in concrete roads, H. S. Spackman (*Concrete-Cement Age, 3 (1913), No. 6, pp. 261–263, figs. 3*).—The author gives curves of test data showing the extent to which the drainage of water from the concrete may cause shrinkage within the first few hours after being placed. He concludes from his own and other tests "that the change in volume due to climatic influences after the concrete has hardened is not sufficient in itself to cause the cracking noted in concrete roads," and that "the concrete slab is not a continuous structure, but consists of a number of pieces of various

sizes in close contact, but without bond, the cohesion between the several pieces having been broken by microscopical hair-cracks, formed by shrinkage. . . . These natural lines of cleavage form lines of weakness, along which the concrete is easily fractured by external force, which ordinarily would not cause sufficient stress to overcome the cohesion of a solid concrete slab."

Approximate stresses produced by a concentrated load on a continuous slab supported on earth or other yielding foundation, J. W. PEARL (*Engin. and Contract., 41 (1914), No. 6, pp. 186–188, figs. 3*).—The author derives formulas with diagrams to determine the stress produced by a concentrated load on concrete pavement slabs supported on earth or other yielding foundation. He discusses the formulas and illustrates their application to pavements and to flat concrete slabs on columns.

Strength of large pipes, D. R. COOPER and E. R. WEINMANN (*Engin. Rec., 69 (1914), No. 5, pp. 133–137, figs. 16*).—This is a mathematical discussion of stresses in circular conduits, with or without internal pressure, and with various widths of support at bottom.

Reinforced concrete construction, G. A. HOOL (*New York and London, 1912, vol. 1, pp. X+254, figs. 88; 1913, vol. 2, pp. 659*).—The first volume of this work deals with the fundamental principles of reinforced concrete design and includes numerous tables and diagrams to facilitate the calculation and designs of reinforced concrete structures. The work "presupposes a knowledge of the elements of structures." The chapters included are as follows: Concrete; steel; concrete and steel in combination; rectangular beams; slabs, cross-beams, and girders; columns; slab, beam, and column tables; slab, beam, and column diagrams; and bending and direct stress.

Volume 2 covers in some detail the subjects of retaining walls and buildings. The first part is subdivided into chapters on theory of stability, design, and construction of retaining walls. The second part deals with buildings, the first section including chapters on floors, types of reinforcement, roofs, columns, foundations, walls and partitions, stairs, contraction and expansion, shear and moment considerations in continuous beams, eccentric load consideration in columns, and wind stresses. The second section contains chapters on materials, forms, bending and placing of reinforcement, proportioning, mixing, and placing of concrete, finishing concrete surfaces, and waterproofing of concrete. The third section covers estimating unit costs, estimating quantities, and an example of an estimate for a concrete building.

[Farm power and machinery] (*Prairie Farmer, 86 (1914), No. 3, pp. 123, figs. 8*).—Special articles on farm power are included as follows: Tractor *v.* Horse as a Source of Farm Power, by H. J. Sconce (pp. 81, 82); Shall I Buy a Farm Tractor? by I. W. Dickerson (p. 82); [The Work of the Gas Engine], by F. M. White (pp. 83, 95); Points on the Purchase and Care of Farm Machinery, by C. O. Reed (pp. 83, 84, 96); The Windmill as a Source of Power on the Farm, by E. A. White (pp. 85, 96, 97); [Household Power Conveniences], by L. W. Chase (pp. 87, 105, 106); and [Farm Machinery Review for 1914], by F. M. White (pp. 85–87, 100, 101, 103, 106, 107, 111, 119).

Farm motors, A. A. POTTER (*New York and London, 1913, pp. IX+261, figs. 278*).—This book is intended to include the fundamental principles governing the construction, working, and management of motors which are suitable for farm use, including steam engines, gas, and oil engines, traction engines, automobiles, water motors, windmills, and electric motors. The method followed in each chapter is to give (1) the fundamental principles underlying the particular motor, (2) the principal parts of the motor, (3) the auxiliary parts, (4) the uses to which the particular type of motor is adapted, and (5) the selection, erection, and management of the different machines. Practical

information is given regarding steam, gas, and electricity, and some space is devoted to the more refined methods used in engineering practice for improving the economy of various motors. It is the opinion of the author that a knowledge of the best engineering practice is not only of considerable educational value but will lead to the more perfect manipulation of the simple farm motors.

"While this book was prepared primarily as a text-book for students in agricultural engineering, the subject matter is so presented that it will be of equal value to farmers and to operators of various kinds of engines and motors."

The adaptation of kerosene to gasoline engines, G. A. RICHTER and B. L. PIERCE (*Sci. Amer. Sup., 77 (1914), No. 1984, pp. 22, 23, figs. 5*).—The experimenters confined themselves to the utilization of kerosene with special reference to water injection methods. A single cylinder 4-cycle engine rated at 5½ horsepower at 650 revolutions per minute was used. The method of water injection consisted of a jacketed intake pipe terminating below in a T connection, which was fitted with elbows. A carbureter was fitted into each of the two elbows, with the idea of injecting both the kerosene and the water by means of respective vaporizers.

Kerosene when used alone caused excessive cylinder carbonization, but the injection of water with the kerosene cooled the cylinder walls, removed carbon and tended to prevent its deposit to an objectionable degree, and reduced the violence of the explosions. The injection of water also appreciably increased the thermal efficiency, the maximum efficiency being observed when the ratio of water to kerosene was 22:100 by weight. Absolute control of this ratio was not necessary as this maximum efficiency remained practically constant for several points to either side. Cylinder carbonization was decreased 82 per cent by injecting water with kerosene, and an oxidizing solution of ammonium nitrate increased this value to 88 per cent, but its use was not warranted. Spark plugs with long points were more satisfactory than those with short points when kerosene was used.

The water jacketed intake heated to a temperature of 60° C. is considered sufficient to give satisfactory carburetion with kerosene. "The field advantageously affected in efficiency by water injection is limited from one-third to full load for the engine in question."

The use of internal-combustion motors in Danish agriculture, C. L. FEILBERG (*X. Cong. Internat. Agr. Gand. 1913, Sect. 4, Question 1, pp. 8*).—A review of statistical data indicates steady progress in the use of internal-combustion power in Danish agriculture. The 2-cycle crude oil motors of domestic manufacture are said to be preferred. Private electrical systems are usually installed on the larger estates using crude oil motors for power. On medium sized estates portable and stationary internal-combustion motors are more used, with various methods of mechanical transmission of power. The smaller agriculturists rarely use internal-combustion motors but often belong to electrical associations and use small portable electric motors.

The science of laying out and the art of plowing with power (*Peoria, Ill., 1913, pp. 8, figs. 7*).—This work is diagrammatically illustrated.

Recent tests of mechanical cultivation in France, G. COUPAN (*X. Cong. Internat. Agr. Gand. 1913, Sect. 4, Question 1, pp. 13*).—A discussion and comparison of the more recent mechanical cultivation experiments in France, in which the conclusion is drawn that the different tests have not given sufficiently concordant results regarding the direct purpose of the tractor. This is attributed to the extreme difficulty of eliminating all the causes of error. For

this reason it is thought that all such tests should be conducted before the judges only and that the general public should be excluded.

Motor cultivation by tractors or rotating cultivators, K. DE MEYENBURG (*X. Cong. Internat. Agr. Gand, 1913, Sect. 4, Question 1, pp. 10*).—This is a comparative discussion of tractor-drawn plows and motor scarifiers or rotating cultivators in which the author favors the latter type.

Basis for the testing of mechanical cultivating implements, F. GIORDANO (*X. Cong. Internat. Agr. Gand. 1913, Sect. 4, Question 1, pp. 9, pls. 2, figs. 5*).—In the testing of soil cultivating machinery the importance of first determining the tenacity or cohesive properties of a soil and the frictional resistance of the soil particles to a metal wedge is pointed out, and a device for determining these physical characteristics of the soil is described.

Motor-drawn and motor-operated grain binders, M. RINGELMANN (*Jour. Agr. Prat., n. ser., 78 (1914), No. 2, pp. 54–57, figs. 3*).—The author reviews the results of dynamometer tests of grain binders and shows by curves of data the tractive power required for drawing the binder and for operating the mechanism. He concludes that the average binder in average wheat or oats with a 1.5 meter sickle and a speed of about 1.2 meters per second will require a 4-horsepower motor for operating the mechanism alone, and a 14 to 15-horsepower motor for both locomotion and operating the mechanism, due allowance being made for possible grades and obstructions.

Experiments with an electrically-driven thrashing machine, G. COUPAN (*X. Cong. Internat. Agr. Gand. 1913, Sect. 4, Question 1, pp. 14–16*).—These experiments show that the hulling, cleaning, etc., of grain require only a small part of the total power utilized by the thrasher, the greater portion being consumed by the friction of the mechanism.

Operating characteristics of centrifugal pumps, A. B. MORRISON, JR. (*Power, 39 (1914), No. 5, pp. 166–168, figs. 2*).—Centrifugal pumps are discussed from the standpoint of operation, taking up particularly the effect of speed and head on the capacity, and the influence of throttling *v.* some form of speed control on the efficiency.

The author is of the opinion that wherever feasible some form of speed control should be used. "It is almost impossible to determine accurately beforehand the head against which the pump will work, and with a fixed speed any change in piping or operating conditions may make a great difference in the amount discharged and in the power required." Curves and data are included.

The cost of pasteurizing milk and cream, J. T. BOWEN (*U. S. Dept. Agr. Bul. 85 (1914), pp. 12, fig. 1*).—This bulletin deals with the cost of pasteurization by the "holder" and "flash" processes from an engineering point of view, and contains information for proprietors of creameries and milk plants and for designers and manufacturers of pasteurizing apparatus. Tests are reported on the milk pasteurizing equipment of five city milk plants and on the cream pasteurizing equipment of four creameries, the latter covering both the flash and holder processes.

In the milk pasteurization test, live steam was used taken direct from the boiler, but reduced in pressure to from 3 to 5 lbs. while the cream pasteurization was accomplished by using (1) live steam direct from the boiler, (2) exhaust steam from the engine or from steam-driven pumps, and (3) hot water heated by the exhaust steam from the steam-driven auxiliaries.

Data of the tests relative to heating, cooling, heat balance, temperature balance, and costs are given in tabular form. The average cost of pasteurizing 1 gal. of milk was found to be 0.313 cts., and the average cost of pasteurizing 1 gal. of cream, 0.634 cts.

The conclusions drawn from the test are as follows: The flash process of pasteurization requires approximately 17 per cent more heat than the holder process and there is a correspondingly wider range through which the milk or cream must be cooled. The proper design and arrangement of the heater, regenerator, cooler, piping, and refrigerating apparatus have much to do with the efficient operation of the plant. With poorly arranged apparatus and leaky piping the loss in heat may reach approximately 30 per cent of that required to pasteurize, which it is practicable to reduce to a negligible amount. It is practicable to use exhaust steam from the engine and steam-driven auxiliaries, or water heated by exhaust steam, to furnish heat with which to pasteurize both milk and cream. Usually there is sufficient heat in the exhaust steam which is allowed to waste in milk plants and creameries to do the pasteurizing. For every 400 lbs. of milk pasteurized per hour with exhaust steam, approximately one horsepower is taken off the boiler plant.

Electric stimulation of plant growth, W. D. PEASLEE (*Jour. Electricity, 32 (1914), No. 4, pp. 69–72, figs. 8*).—Studies of stimulation of plant growth by electrical methods are reported.

A direct current passing through the soil containing the seeds or roots of plants caused a gain in root structure, and the electrified plants after transplanting were more hardy and grew faster than the nonelectrified. Similar tests with alternating currents gave positive results only at very low power values.

The application of a voltage stress to the atmosphere around plants caused good results only when the stress was applied on cloudy days and at night. Two important points brought out are (1) that no difference in stimulative effect was found when using the ground as positive or negative, and (2) that there is some tendency to show for all plants a curve approximating a straight line within certain limits, the slope of this curve being different for each plant. Practically the same results were secured when using a Tesla coil as when using a Wimshurst machine.

It is concluded in general that indirect stimulation of the root or plant increases the functional activity of the organs if they are far enough from the point of application of the stimulus to avoid the effect of direct stimulation. Though the immediate effect of direct stimulation is to retard growth, it increases the internal energy of the plant and the after effect is to increase the growth rate. Plants are very sensitive to fatigue and the stimulation must be of such degree and duration that fatigue is avoided if the net result of the treatment is to be beneficial.

The dissolving of zinc from pure zinc and galvanized iron pipes by water supplies, K. B. LEHMANN (*Jour. Gasbeleucht., 56 (1913), pp. 717–722; abs. in Wasser u. Abwasser, 7 (1914), No. 10, pp. 423, 424*).—Investigations by the author and others on the action of both hard and soft water on galvanized and pure zinc water pipes show that under the best conditions the zinc content of the water was always moderate, and greater amounts were obtained from the galvanized than from the pure zinc pipes as long as zinc remained on the galvanized pipe. It is concluded that the use of pure zinc water pipe is hygienic and unobjectionable.

The hot water supply plant for private houses, C. A. GULLINO (*Gsndhts. Ingen., 37 (1914), No. 2, pp. 24–28, figs. 6*).—The author discusses in detail the design of private hot water supply plants for both city and farm houses, economy and efficiency being the chief considerations.

Elements of heating, E. N. IRWIN (*Power, 39 (1914), No. 3, pp. 89–92*).—This article gives practical information regarding air, steam, and water as media for the distribution of heat, including tables of data for computing the heat losses from a building and the radiating surface required.

Some suggested designs for sewage treatment plants for residences and small institutions, P. HANSEN (*Abs. in Engin. and Contract., 41 (1914), No. 5, pp. 169–172, figs. 3*).—This article gives data on the cost of installing a plumbing system, the design and operation of simple septic tanks, a modified Imhoff tank adapted to the use of a household of 10 persons, a subsoil irrigation system, an intermittent sand filtration plant to handle the sewage from 25 persons, and a double contact filtration plant.

A combination cesspool and septic tank, J. F. DULING (*Engin. News, 71 (1914), No. 6, p. 305, fig. 1*).—A combination cesspool and septic tank, which is recommended for use in porous sandy soils underlaid by gravel in localities where the domestic water supplies are taken from shallow wells, is illustrated and described.

A new suggested method of water testing for plumbing fixtures, H. F. SHADE (*Dom. Engin., 66 (1914), No. 7, pp. 200, 201, figs. 2*).—A new method of water testing of plumbing fixtures to take the place of the usual air or water tests is described and its application illustrated.

Plumbing practice as seen by the inspector (*Dom. Engin., 66 (1914), No. 7, pp. 198–200, figs. 9*).—This report illustrates and describes recent developments in plumbing fixtures and in arrangements of plumbing, including faucets, connection of vent lines, traps with concealed partitions, and grounding of electric fixtures in bathrooms.

RURAL ECONOMICS.

The agricultural outlook (*U. S. Dept. Agr., Farmers' Bul. 584 (1914), pp. 22*).—This bulletin contains statistical data showing by States the estimated stocks on farms and in interior mills and elevators, price per bushel March 1, and percentage of crop which moves out of the county where grown for wheat, corn, oats, and barley; wages of male farm labor per month with and without board, and at harvest season and at other times per day with and without board; percentages of increase in wages from 1893, 1899, and 1909 to 1913; the average length of time per day required of hired labor; prices of agricultural products March 1, 1913, and 1914 for rye, buckwheat, potatoes, hay, flax, cotton, butter, eggs, and chickens; and the aggregate value per acre of the 12 leading crops.

Accompanying these tables are a short discussion and two articles, one on preparing seed corn for planting, by C. P. Hartley, and the other on the preparation of seed grain for spring planting, by M. A. Carleton.

It is reported that the money wages of farm labor increased about 2.5 per cent during the past year and about 11 per cent during the past 4 years. The average length of time required per day of hired labor on farms is reported by correspondents at 9 hours 48 minutes.

The value per acre of crop production in 1913 is estimated at approximately $16.31, the highest average thus far recorded.

Agricultural production in West Virginia, O. M. JOHNSON (*West Virginia Sta. Bul. 144 (1914), pp. 37–68, figs. 33*).—The author, by means of county outline maps, shows graphically the localization of farm crops and animals, the average yields, the number of mature horses per farm, the total value of all farm property, the percentage of tenants on farms, and the percentage of farms with mortgages. By the use of census and other data he has estimated, by counties, the income and expenses per farm in order to obtain the labor income per farm family, and estimates the average labor income per farm family for the State as a whole as $181. The highest for a single county was $402. On this basis, there were two counties which even failed to produce enough to pay

5 per cent interest on the investment. He found those counties more prosperous which have a large investment in live stock.

One-half of the rural section of the State shows a decrease in population. The farms are somewhat smaller than 10 years ago and most of the staple crops are decreasing in their total acreage and production. The planting of young orchards is increasing rapidly.

Some indications of the economic and agricultural progress of Argentina (*Internat. Inst. Agr. [Rome], Mo. Bul. Econ. and Soc. Intel., 4 (1913), No. 10, pp. 1974–1332*).—After describing the natural and agricultural resources of the country it is shown that the total cultivated area increased from 580,008 hectares (1,432,620 acres) in 1872 to 2,459,120 hectares in 1886, and to 21,838,689 hectares in 1911. The production of wheat increased from 1,263,000 tons in 1895–96 to 5,400,000 tons in 1912–13, flax from 232,000 tons to 1,130,000 tons, and corn from 2,240,000 tons to 5,000,800 tons. During practically the same period the number of plows imported increased from 10,660 to 83,483, reapers from 2,723 to 11,534, seeders from 719 to 21,962, and threshers from 299 to 1,127.

It is also shown that there has been a marked increase in the number of live stock, the number of native bred live stock decreasing and the number of half-bred and thoroughbred increasing. Between 1896 and 1912 the value of the exports of agricultural produce and live stock increased from 113,666,625 pesos ($109,688,263) to 466,402,528 pesos.

Attention is called to the fact that, although there are many holdings of extremely large sizes, the number of small holdings is increasing rapidly.

[Agricultural statistics of British India] (*Agr. Statis. India, 28 (1907–1912), I, pp. 111+420*).—This is the annual statistical statement showing the areas devoted to different agricultural purposes, irrigated, in fallow, and in specified crops; the number of live stock, plows, and carts; and the number of transfers of land and areas transferred.

[Land tenure and settlement; agriculture and live stock in New Zealand], M. Fraser (*New Zeal. Off. Yearbook 1913, pp. 481–587, pls. 2, fig. 1*).—This annual report contains information concerning the distribution of crown and native lands, land transfer and deeds registration, occupation and ownership of land, area and yields of farm crops, and number of live stock.

[International statistics of agriculture] (*Statis. Aarbok Konger. Norge, 33 (1913), pp. 249–252*).—This statement contains data showing for a large number of countries and for the latest year available the area and production of wheat, rye, barley, oats, corn, rice, potatoes, and sugar beets, and the number of horses, mules, asses, cattle, sheep, goats, and swine.

Is scarcity to be preferred to plenty? L. R. Johnson (*Breeder's Gaz., 65 (1914), No. 9, pp. 461, 462, figs. 3*).—The author concludes that large crops mean prosperity to the many and small ones prosperity to the few, and that even though the farmer may get less for the large crop its influence reaches into all the channels of business and produces in the aggregate greater national prosperity.

History and description of a farm in the valley of the Unstrut, M. Schöne (*Landw. Jahrb., 45 (1913), No. 4, pp. 597–608*).—This article describes the changes that have taken place since 1863 in a farm belonging to the same family. After noting the climate and topography of the region the author shows, for 5-year periods beginning with 1872–1876, the area devoted to the different crops, yield and value per morgen, fertilizers used, number of work animals and other kinds of live stock, price per pound and quantity of milk used in making butter, agricultural machinery used, and number of laborers and their wages.

The division of capital in agriculture as between landlord and tenant, R. PAGET (*Jour. Farmers' Club [London], 1914, Mar., pp. 23–30*).—According to the present system of leasing farm land it is the produce of the farm and not the profit that is divided between landlord and tenant. The author outlines a system which "is based on the assumption that in the average case it would be fair that the farmer should have as much of the profits in respect of his skill and management (apart from any capital he may invest) as the landlord gets in respect of the use of his land and buildings, and that whoever puts in the capital should get a further share of profits in respect of this investment."

Landed proprietors and agriculture in Norway (*Statis. Aarbok Konger. Norge, 33 (1913), pp. 39–45*).—Statistical data are given showing for 1907 the total number of landed proprietors and their distribution by areas cultivated. Data are also presented for 1907 showing the area devoted to the principal agricultural purposes and for 1912 the area and production of the principal farm crops. For the latter item comparative data are given for earlier years.

Farm credit conditions in a cotton State, L. H. HANEY (*Amer. Econ. Rev., 4 (1914), No. 1, pp. 47–67*).—The author describes the farm credit situation in Texas as determined by a special investigation. He shows the type of credit furnished to the farm owners by the banks and to the tenants by the storekeeper and landlords and indicates the inability of the present system to supply adequate credit at reasonable rates. He advocates that a cooperative organization be formed which should seek to become an effective credit middleman between the present latent and ill-used bases of credit among farmers and the funds held in commercial banks.

Helping the farmer to keep his farm, E. N. BREITUNG (*Business America, 15 (1914), No. 3, pp. 210–212*).—According to the author, one of the worst features of the present system of mortgaging farms is that if the farmer is unable to meet the payments, because of some disaster unforeseen, he may lose his farm at once. To prevent this he would have the farmer under such conditions contract to keep his property up to a certain standard and would form a company with a large credit capital to work the farm in order to pay off its indebtedness and meet the obligations out of the company's surplus. If the farmer is competent he could remain on the land, and as soon as the farm is out of debt it will come back to him.

Special report of New York State delegates on the American Commission for the study of agricultural cooperation in Europe, compiled by F. H. ALLEN and C. C. MITCHELL (*N. Y. Dept. Agr. Bul. 56 (1914), pp. 747–1048, pls. 32*).—This report notes the most striking facts observed in European agriculture and contrasts them with conditions in New York, describes the business organization and agricultural conditions in Europe and points out that the raising and transportation of products constitutes the farmer's part in feeding the nation while marketing and agencies of delivery come within the sphere of the consumer.

Among the greatest needs of the State of New York are considered a readjustment of the existing methods of distributing farm crops, cooperation among the consumers in purchasing, the commercializing of agricultural business, simpler and cheaper means of borrowing money, better roads in the country and particularly the side roads, and practical demonstration on the farm of what it is possible to do under average conditions in farming for profit.

Instruction in marketing (*Daily Cons. and Trade Rpts. [U. S.], 17 (1913), No. 60, pp. 961–970*).—This report consists of a general description of the various methods employed to give instruction in cooperation and marketing in Germany, Netherlands, Denmark, France, and England.

The story of the C. W. S., P. REDFERN (*Manchester: Coop. Wholesale Soc. Ltd.* [*1913*], *pp. VIII+439, pls. 83, figs. 9*).—This book contains a very complete description and history of the Cooperative Wholesale Society Limited beginning with 1863.

The organization and present status of the Prussian Chamber of Agriculture, A. OBERG (*Über die Organisation und Zuständigkeit der Preussischen Landwirtschaftskammern. Inaug. Diss., Univ. Greifswald, 1913, pp. 116*).—The author discusses the history, establishment, organization, and efficiency of the Prussian Chamber of Agriculture.

AGRICULTURAL EDUCATION.

Rural life and education, E. P. CUBBERLEY (*Boston, New York, Chicago,* [*1914*], *pp. XIV+367, pls. 22, figs. 81*).—The first part of this book sets forth the rural life problem in its historical development and shows the origin and present status of the rural school problem. The second part sets forth more specifically the present rural school problem and points out the fundamental remedies which must be applied for its solution.

Among the legitimate functions prescribed for the redirected school are the conservation of soil fertility, the improvement of farm methods, the dissemination of agricultural and general knowledge, the improvement of home life, etc. There should be added to the course of study of every rural school, in place of much that has been and often still is taught, instruction in nature study, school gardening, agriculture, manual training, domestic science, music, and play. The work in agriculture, home economics, and manual training should be extended and carried on in the high school and rural teachers should be trained in agriculture. Appended to each chapter is a list of questions for discussion, and to the end of the book a bibliography of 80 titles of recent literature bearing on the rural problem.

Educational resources of village and rural communities, J. K. HART (*New York, 1913, pp. X+277*).—This book discusses the great main lines of community interest, activity, and resource and their part in the education of the child and the community. Two chapters are devoted to the sort of school that is needed to meet the changed needs of our times.

"Since agriculture is our chief primary industry, the redirected education for the open country must be agricultural in its nature . . . must aim to make better farmers and better helpmeets for these farmers, must make the occupation more remunerative, and the whole life more satisfactory and free from city domination."

"Nature study should form the background for the greater part of the rural school curriculum." It is suggested that nature study in the first 5 years be followed in the last 3 years with nature study and agriculture. "The entire 8 years' course may be considered as an accumulative growth unmarked by any break to show where nature study ends and agriculture begins."

Each subject is followed by questions directing students to specific phases of the subject which should be looked for and thoroughly studied in each local community, and by a brief bibliography.

Rules and regulations [governing the instruction in agriculture and domestic science], T. H. HARRIS (*Baton Rouge, La.: State Supt. Pub. Ed., 1913, pp. 11*).—This pamphlet contains the rules and regulations adopted by the state board of education to govern departments of agriculture and domestic science, and suggestive lists of implements, equipment, etc., to be used in such departments.

The agricultural instruction act (*Agr. Gaz. Canada, 1 (1914), No. 1, pp. 31–38*).—The text of the act, approved June 6, 1913, appropriating $1,000,000 for the advancement of agricultural instruction in the provinces of Canada (E. S. R., 29, p. 198) is given, together with the form of agreement of provincial governments under the act, and an itemized statement of federal appropriations to provinces in 1913–14.

[Progress in agricultural education in Canada in 1913] (*Agr. Gaz. Canada, 1 (1914), No. 2, pp. 69–139, figs. 16*).—This number is devoted largely to progress in agricultural education in Canada, including the following articles: The Ontario new field husbandry building, work of the department of agriculture in Prince Edward Island, progress of agricultural education in Nova Scotia, agricultural education in New Brunswick, agriculture in the Province of Quebec, acre profit competition in Ontario, agricultural instruction in Manitoba, agricultural extension work in Alberta, boys' potato growing contests in Carleton and Russell Counties in 1913, and the rural school problem and its relation to agricultural teaching.

Agricultural organization in Belgium (*Notice sur l'Economie Rurale et l'Organisation Administrative de l'Agriculture. Brussels: Min. Agr., 1913, pp. 86, pls. 9*).—This publication, prepared for the 1913 exposition at Ghent, gives brief accounts of the organization of the ministry of agriculture, veterinary instruction, and affairs, official and private agricultural associations, agricultural and horticultural eduction and research institutions, agricultural courses in nonagricultural institutions, agricultural home economics schools, elementary and popular agricultural instruction, the service of state "agronomes" and horticultural advisers, agricultural statistics, special phytopathological service, etc.

Nature-study and the teaching of elementary agriculture, Anna B. Comstock (*Nature-Study Rev., 10 (1914), No. 1, pp. 1–6*).—In the author's opinion, the only way to make the teaching of elementary agriculture "of permanent value is to ground it in nature study, because in nature study the child finds the answer to the why of agriculture and the following up of this why broadens out in so many directions that there is no chance of the agricultural processes becoming an old story." She considers how and why nature lessons on the soil, seed testing, form, growth, and function of roots, leaves, and flowering plants, fertilization of flowers, weeds, insect pests, birds, and live stock add permanency of value and interest to elementary agriculture.

Some students' work (*Nature-Study Rev., 10 (1914), No. 1, pp. 24–29*).—These observations by normal school students consist of field work in the identification and study of the general habits of a number of birds, and a nature calendar of birds, flowers, trees, shrubs, insects, farm activities, and other observations.

The present status of nature-study in the elementary schools, Alice J. Patterson (*Nature-Study Rev., 9 (1913), No. 8, pp. 239–244*).—In an investigation of nature-study methods in the schools of this country, based on a study of the state courses of 20 States and those of 30 large cities and representing the 4 geographical regions of the country, the author finds that (1) nature study is recognized as a school subject in both state and city courses in all parts of the country; (2) there is considerable unity of purpose in the courses offered, namely, to bring children into intelligent and sympathetic touch with daily life and to train them in a scientific attitude of mind; and (3) the material suggested is that found in the environment of the schools. The biological phase receives greatest emphasis. State courses give a decided agricultural trend to the work of the grammar grades. Gardening, making collections, setting up apparatus, and other hand work constitutes a fair proportion

of the courses, and definite correlation with other school subjects is suggested in the majority of the outlines.

The school gardens of Saginaw, KATE M. PASSOLT (*Nature-Study Rev., 10 (1914), No. 2, pp. 53–56*).—The development of school gardens in Saginaw, Mich., which were commenced in 1903, and the course in gardening are outlined.

Should school gardens survive? A. D. CROMWELL (*Nature-Study Rev., 10 (1914), No. 1, pp. 30–32*).—The author discusses the kinds of school gardens which should and should not survive, and in view of the greater popularity of the city over the country school garden suggests how plant breeding can be made a very promising field for the latter.

Supervising a community garden in summer, ELIZABETH M. WATERS (*Nature-Study Rev., 10 (1914), No. 2, pp. 65–68*).—The author gives an account of her experience in supervising a community garden in Chicago in the summer. In conclusion she suggests that this kind of work be put on an industrial basis, that the gardening be done so well and so systematically that it shall yield a profit, that it is wiser that the children should not have all the profit but learn to share the profits, and that getting some pin money in this way lessens the temptation to steal, while estimating the commission gives real practice in percentage.

The lay of the land, J. G. NEEDHAM (*Nature-Study Rev., 10 (1914), No. 1, pp. 14–18*).—A discussion of the natural lay of the land is followed by a lesson of the natural fields of the farm, taken from the author's field course on the natural history of the farm now being given to freshmen in Cornell University.

Farmers' institute and agricultural extension work in the United States in 1913, J. HAMILTON (*U. S. Dept. Agr. Bul. 83 (1914), pp. 41*).—This is the annual report of the Farmers' Institute Specialist of this Office for 1913 concerning the work of the Office in promoting farmers' institutes and the development of the farmers' institute movement in the different States and Territories. It includes also, among other things, an account of the growth of the institutes during the last decade, administrative methods in use, extension work by the agricultural colleges, the annual meeting of the American Association of Farmers' Institute Workers, a meeting of the section on extension work of the Association of American Agricultural Colleges and Experiment Stations, correspondence schools, aid to agriculture by transportation companies, and agricultural extension work in foreign countries; a list of the state officials in charge of farmers' institutes; and the usual statistical tables covering various lines of institute effort.

MISCELLANEOUS.

Annual Reports of the Department of Agriculture, 1913 (*U. S. Dept. Agr. Rpts. 1913, pp. 370*).—This contains the reports of the Secretary and heads of bureaus and other administrative officers. The various reports are also issued as separates.

Twentieth Annual Report of Minnesota Station, 1912 (*Minnesota Sta. Rpt. 1912, pp. XLVI+186+V, pls. 5, figs. 83*).—This contains the organization list, a list of the publications of the year, a financial statement for the fiscal year ended June 30, 1912, a report of the director summarizing the work of the station and its substations, and reprints of Bulletins 125–128, previously noted.

Twenty-first Annual Report of Minnesota Station, 1913 (*Minnesota Sta. Rpt. 1913, pp. 92, figs. 3*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1913, and a report of the director summarizing the work of the station and its substations. Portions of the report relating to dairy and animal husbandry have been abstracted elsewhere in this issue.

Report of the director, 1913, J. G. LIPMAN (*New Jersey Stas. Bul. 263 (1913), pp. 57*).—This contains the organization list, a report on the work and problems of the station during the year ended October 31, 1913, and a discussion of its opportunities and needs.

Finances, meteorology, index (*Maine Sta. Bul. 222 (1913), pp. 319–325+XX, pls. 2, figs. 3*).—This contains the organization list of the station; meteorological observations noted on page 117 of this issue; a financial statement for the fiscal year ended June 30, 1913; an index to Bulletins 209–222, which collectively constitute the twenty-ninth annual report of the station; a list of the publications issued during the year; and announcements and notes on the work, personnel, and equipment of the station, including a description of the station building.

The relation of the experiment station to the agricultural college and to university extension, S. B. DOTEN (*Better Farming [Univ. Nev.], 1 (1913), No. 7, pp. 1–8*).—A discussion designed to give "a clear idea of the differences between the experiment station work and the work of the agricultural college and work in extension."

[Annual Report of the Rothamsted Experimental Station, 1913], E. J. RUSSELL (*Rothamsted Expt. Sta., Harpenden, Ann. Rpt. 1913, pp. 32*).—A progress report for the year.

The organization of experimental work in agriculture in the German colonies, W. BUSSE (*Bul. Imp. Inst. [So. Kensington], 11 (1913), No. 3, pp. 462–478*).—An account of the experimental work undertaken in the German colonies in Africa and Samoa with a discussion of its opportunities and needs.

Laws and regulations relating to the work of the department of agriculture of the State of Washington (*Olympia, Wash., 1913, pp. 127*).—A compilation of the statutes governing the work of the Washington State Department of Agriculture and the rules and regulations promulgated for their enforcement.

New Jersey handbook of agriculture, compiled by A. L. CLARK (*N. J. Handbook Agr., 1912, pp. 43, pls. 20*).—Part 1 of this handbook discusses the agricultural resources of New Jersey; part 2, its agricultural industries; and part 3, agricultural education. Much of the material was prepared by members of the staff of the New Jersey College and Stations.

The farmers' ready reference book (*St. Joseph, Mo. [1913], pp. 186, figs. 36*).—A collection of articles on various farm topics, based largely upon the publications of this Department, the state experiment stations, and the experience of individual farmers.

Bibliography of scientific writings by the late William McMurtrie, E. M., Ph. D.—Agricultural chemistry, textile fibers, industrial chemistry, technical education, and sanitation, compiled by D. C. MCMURTRIE (*New York, 1913, pp. 6*).

NOTES.

Arkansas University and Station.—J. S. Knox, who received the M. S. degree from the University of Idaho at its recent commencement, has been appointed instructor in horticulture in the college and assistant horticulturist in the station.

Illinois University.—The trustees have included in the annual budget an item of $374,000 for the purchase of agricultural land and building sites for the college of agriculture.

Purdue University.—Clayton R. George has been appointed assistant in dairying in the extension department.

Kansas College and Station.—A corps of extension workers has been holding meetings and demonstrations on typical farms of Bourbon and Cowley counties. Four meetings were held daily and a total of about 1,500 farmers was in attendance. It is planned to conduct similar field campaigns in at least 12 counties next year.

W. L. Blizzard, assistant animal husbandman, resigned July 15 to accept a position with a Kansas syndicate of farm publications.

Massachusetts College.—The construction of the new agricultural building for which the legislature granted $210,000 is under way. The plans call for a modern fireproof structure of brick and concrete with 166 feet frontage and 156 feet in depth, making the structure the largest on the campus. It will contain lecture rooms, offices, a library, two large laboratories, and an auditorium seating nearly 1,000 people.

Mississippi Station.—J. K. Morrison has resigned as poultryman and has been succeeded by E. P. Clayton, superintendent of education for Lee County since 1908.

Missouri University.—The university celebrated on June 3 the seventy-fifth anniversary of its founding. Secretary of Agriculture D. F. Houston was among those delivering addresses and subsequently received the degree of LL. D.

New Mexico College and Station.—H. S. Hammond, professor of biology and botany, resigned July 1.

Cornell University.—The new forestry building was opened May 15 in connection with the meeting of the Society of American Foresters. It is a four-story brick structure, 142 by 54 feet, costing $120,000 and constituting the first of the proposed plant industry group. The ground floor contains wood technological and timber testing laboratories, and those above laboratories, classrooms, etc., for mensuration, utilization, silviculture, and dendrological work. For the present it will also house the department of plant breeding.

Ralph S. Hosmer, superintendent of forestry in the Territory of Hawaii since 1903, has been appointed head of the department of forestry vice Walter Mulford, who has accepted a similar position at the University of California. G. W. Peck, instructor in pomology, has resigned to become manager of a large orchard in Ohio. David Lumsden, instructor in floriculture and landscape gardening and superintendent of greenhouses and grounds at the New Hampshire College,

and assistant in floriculture in the station, has been appointed assistant professor of floriculture, beginning June 1, Miss Clark L. Thayer has been appointed assistant in investigation.

Ohio State University.—Walter C. O'Kane, entomologist of the New Hampshire College and Station, has been appointed professor of applied entomology, beginning September 1.

Oregon College and Station.—Director Cordley is spending much of the summer in a study of the various substations with a view to securing closer coordination of the various lines of college and station work and their closer relationship with several new phases of agricultural development. Claude I. Lewis, for the past 8 years head of the department of horticulture, has been appointed vice director of the station. Carl N. Kennedy, instructor of animal husbandry at the Texas College, has been appointed professor of animal husbandry, his duties including the work with horses and the secretaryship of the State Stallion Registration Board. Ralph Reynolds has been appointed extension professor of animal husbandry to have charge of the extension work with all classes of live stock except dairy cattle.

Pennsylvania College and Station.—The new horticultural building was dedicated June 10, Prof. F. A. Waugh of the Massachusetts College delivering the principal address on The Arts of Peace. The Students' Horticultural Association presented to the college at that time a portrait of the late Gabriel Hiester, president of the State Horticultural Association and a most active member of the board of trustees.

J. D. Harlan, assistant in experimental agronomy, resigned May 1 to become agronomist with a chemical manufacturing firm of Pittsburgh, which is operating a test farm of 130 acres near Cleveland, Ohio. It is announced that special attention is being given to work on the effect of radium on the growth of crops under field conditions.

R. S. Maddox, instructor in forestry, has been appointed state forester of Tennessee beginning September 1. Walter B. Nissley, instructor in horticulture, has been appointed head of the department of vegetable gardening at the New York State School of Agriculture recently opened on Long Island.

Clemson College and Station.—S. W. Evans has been appointed secretary and treasurer of the college and treasurer of the station, vice Dr. P. H. E. Sloan resigned.

Texas College.—Short courses of from three to six days duration are to be offered in 18 towns representing 17 counties of the State. Members of the faculty are to be in charge of the various schools, in close cooperation with the county and district agents of the farmers' cooperative and demonstration work of this Department.

Vermont University and Station.—G. S. Fassett, for nearly 25 years connected with the governing board of the university and station, has resigned to take effect July 1. Z. M. Mansur, also a trustee, died in April. Warren R. Austin of St. Albans and Guy W. Bailey of Essex Junction, both alumni of the university, have been appointed to fill the vacancies.

Washington College and Station.—The station is establishing an arboretum in which it is proposed to grow a group of each of the important timber trees of the Temperate Zone. W. D. Hislop, assistant professor of animal husbandry at the Ohio State University, has been appointed professor of animal husbandry and animal husbandman.

West Virginia University and Station.—E. W. Sheets of the extension division has been appointed professor of animal husbandry and animal husbandman. D. C. Neal and Oliver Smith, assistants in plant pathology and agronomy, respectively, are no longer connected with the institution.

Wyoming Station.—A. D. Faville, animal husbandman, and Frank E. Hepner, research chemist, have been granted leave of absence beginning September 1 and October 1, respectively, for a year's further study. Their work will be carried on by J. E. McWilliams, assistant in wool, and E. N. Roberts, recently appointed assistant chemist.

American Association of Agricultural College Editors.—This association was formally organized at a conference held at the Kentucky Experiment Station, June 25 and 26. Delegates were in attendance from the colleges and stations of 13 States, as well as this Department, as follows: Georgia, Illinois, Iowa, Kentucky, Maryland, Massachusetts, Michigan, Minnesota, Ohio, South Carolina, Tennessee, West Virginia, and Wisconsin.

The conference was called to order by the executive secretary, Dr. B. E. Powell of the University of Illinois. An address of welcome was given by Director Kastle of the Kentucky Station, who drew attention to the enormous increase in publicity agencies within recent years and especially the large amount of space now being given to agriculture by the daily press. He cited some of the difficulties to be avoided in publicity work, and suggested ways in which an association could be effective in bringing about an improvement in conditions.

Data derived from a questionnaire as to The Relations of the Editor and the Bulletin Author and Their Respective Rights were presented by J. O. Rankin of Minnesota. Great diversity of practice was reported from the various States, but there seemed to be a general agreement that while the substantial integrity of the author's contribution must be preserved considerable discretion in handling the material should be vested in the editor, either directly or through the director or a committee on publications.

In a discussion of Editorial Standards for Agricultural Bulletins, F. W. Beckman of Iowa made a plea for simplicity in these publications and for making them as widely useful as possible. In the subsequent discussion, the potential permanent value of many publications was also brought out, as well as the need of giving attention to bibliographical considerations.

W. H. Beal of this Office presented a summary of data showing Results of the United States Department of Agriculture's Survey of Bulletin Reading. This survey indicated that the bulletins were being quite generally read and utilized, either by the farmer directly or ultimately through the use of the material by the agricultural press and the various extension agencies.

An illustrated talk on Bulletin Illustration in Black and White and in Color was presented by A. G. Eldredge, photographer of the University of Illinois. The history of illustrative work was briefly reviewed and some of the more recent processes described in considerable detail.

Much interest was manifested by those in attendance in the various forms of publicity work being conducted. C. A. Whittle, of Georgia, described the system followed in that State, which he estimated to be reaching several hundred thousand readers a week through plate matter furnished the press. The methods in vogue in several other States were more briefly outlined by those in charge. O. M. Kile, of West Virginia, proposed a plan for cooperation in the preparation and use of plate matter and similar material by groups of States.

A tentative draft of a constitution was prepared under which annual meetings are provided and membership is open to those doing editorial work in the agricultural colleges and experiment stations or this Department. Officers were selected as follows: President, C. A. Whittle of Georgia; vice president, O. M. Kile of West Virginia; secretary-treasurer, B. E. Powell of Illinois; and

as additional members of the executive committee, E. H. Forbush of Massachusetts and Reuben Brigham of Maryland. Committees were also provided on cooperation with other organizations and on standards and exhibits. The executive committee is to serve as the program committee and to investigate the feasibility of publishing the proceedings. The next meeting is to be held at the University of Wisconsin in June, 1915.

Fifth International Congress on Rice Culture.—This congress met at Valencia, Spain, May 16 to 24, under the patronage of the King of Spain. The work was divided into eight sections dealing with such topics as rice varieties and their improvement, manures for rice, cultural operations and machinery, rice diseases, the rice trade, cooperation as applied to rice, and the relations of rice growing and malaria.

Fifth International Congress of Genetics.—It is announced that this congress will be held in Berlin in 1916, beginning with the first week in September. The subcommittee in charge of the preliminary arrangements consists of Professors von Rümker and Baur, their addresses being the Royal Agricultural High School, 4 Invalidenstrasse, Berlin.

Necrology.—Felix Wahnschaffe, an eminent authority on soils, died at Berlin, Germany, January 20, 1914, in the sixty-third year of his age. His life and services, especially to agriculture, deserve more than passing notice.

In his thirty-nine years' connection with the Royal Prussian Geological Land Office he made notable and valuable contributions to the knowledge of soils, the more important and permanent results of which are embodied in his Anleitung zur Wissenschaftlichen Bodenuntersuchung published first in 1887 and revised in 1903 and 1914 (in collaboration with F. Schucht).

Wahnschaffe identified himself especially with investigations in glacial geology, the study of soils on a broad geological basis, the application of improved methods in the mechanical and chemical analysis of soils, and the agronomic and geological mapping of soils. He specialized particularly in the study of the geology and agricultural value of the flat lands of north Germany. In this, as in most of his work, he had in mind not only the elucidation of the scientific problems involved but also the utilization of the lands for agricultural purposes and especially for home building. He was influential in the founding of the Internationalen Mitteilungen für Bodenkunde, and was active in the work of the International Agrogeological Congress.

New Journals.—*Revista del Ministerio de Industrias* is being issued monthly in Uruguay. The initial number contains an account of the Institute of Agronomy and Model Farm, an article on Impotence and Sterility in Domestic Animals, statistical and other data regarding various agricultural industries, brief popular articles, etc.

Die Naturwissenschaften is a weekly devoted to the natural sciences, medicine, and technology. The initial number contains, among others, an article by Dr. N. Zuntz on The Significance of the Micro-organisms in Digestion, and one by Dr. Rudolf Ditmar on The Way to Artificial Rubber

Boletin de la Sociedad Forestal Argentina is being published trimonthly by the Forestry Society of Argentina and consists largely of short popular articles of interest to foresters and horticulturists.

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EXPERIMENT STATION RECORD.

Editor: E. W. ALLEN, PH. D., *Assistant Director.*
Assistant Editor: H. L. KNIGHT.

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EXPERIMENT STATION RECORD.

VOL. XXXI. ABSTRACT NUMBER. No. 3.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Biochemistry. C. L. ALSBERG (*Jour. Indus. and Engin. Chem., 5 (1913), No. 12, pp. 1019, 1020*).—The address of the chairman of the section on biological chemistry of the American Chemical Society, as given at the Rochester meeting, Sept. 8–12, 1913. The progress of the science and some of its opportunities are briefly reviewed.

Chemistry of fats, lipoids, and waxy substances. W. GLIKIN (*Chemie der Fette, Lipoide, und Wachsarten. Leipsic, vols. 1, 1912, pp. XVI+789, figs. 91; 2, 1913, pp. XI+788, figs. 10*).—The first volume of this work deals with the general, physical, physiological, and analytical chemistry of fats; the second with the description, preparation, and examination of natural fats, oils, waxy substances, and chemical-technical fat products.

Distribution of alkaloids in the belladonna plant. A. F. SIEVERS (*Amer. Jour. Pharm., 86 (1914), No. 3, pp. 97–112, fig. 1*).—The investigations reported have been previously noted from another source (E. S. R., 30, p. 44).

The leaf oil of Douglas fir. A. W. SCHORGER (*Jour. Amer. Chem. Soc., 35 (1913), No. 12, pp. 1895–1897*).—"The constituents of the leaf oil of Douglas fir with their approximate percentages are as follows: 1-α-pinene, 25; 1-β-pinene, 48; *i* or *l*-limonene, 6; furfural; ester as bornyl acetate, 6.1; free alcohol as borneol, 6.5; 'green oil,' 3; and losses by polymerization, 5 per cent."

Aroma of hops: A study of the volatile oil with relation to the geographical sources of the hops. F. RABAK (*U. S. Dept. Agr., Jour. Agr. Research, 2 (1914), No. 2, pp. 115–159, figs. 14*).—A systematic comparison of the physical and chemical properties of oils distilled from hops obtained from California, Oregon, Washington, and New York was made with those from imported hops from Saaz, Bohemia.

The average yield of oil from the California hops during 1907, 1908, and 1909 was 0.32 per cent, while during the four years 1906–1909 the Oregon hops showed an average oil content of 0.29, the New York hops 0.192 per cent, the Washington hops, distilled only during 1909 and 1910, 0.37 per cent, and the imported hops distilled from the crops of 1906, 1907, 1908, and 1909, 0.31 per cent. When distilled for a period of more than two seasons, all the hops showed considerable fluctuation in the yield of oil.

The color of the various oils ranged from a golden yellow to a dark brown, but the first runnings of all the distillates were nearly colorless. The predominant color seemed to be red or brown. A golden yellow oil was obtained only when the hops were distilled on a small laboratory scale.

The oils from the American hops were all strongly aromatic, and in most cases agreeable. "The oils from the foreign hops seemed to be distinctly different from the American oils, possessing a very pronounced flowery odor, combined with a fatty odor, the effect being most agreeable." All of the oils had a decidedly aromatic taste, and in some bitterness, fattiness, and acidity were pronounced. All of the California oils were characterized by bitterness and pungency with slight fattiness, while the oils from the imported hops were fatty and only slightly pungent and bitter.

The oils having the highest specific gravities were from New York State hops and averaged 0.8554 at 24° C. "The refractive property of the Oregon, New York, and Washington oils, as compared with the California oils, was not greatly different. However, the oils from the imported hops showed a higher refractive index than any of the other oils." The oils most soluble in alcohol come from the Oregon hops, one volume of the oil dissolving completely in three volumes of 94 per cent alcohol. The solubility varied with the seasons.

In the chemical examination the following average constants were determined: Acid number (for California hop oil 1.45, Oregon hop oil 2.7, New York 3.25, Washington 1.25, and Saaz 2.02), ester number (California hop oil 45.56, Oregon 58.8, New York 50.9, Washington 52.8, and Saaz 23.5), and saponification number (California hop oil 47, Oregon 61.5, New York 54.2, Washington 54, and Saaz 21). "The high and low acid numbers were significant of nothing important as far as the aroma was concerned, as the free acidity did not perceptibly affect the odor of the oil. The ester numbers revealed most striking similarities and dissimilarities, not only during one season but for several successive seasons. The oils from the imported hops were conspicuous because of the fact that the data for the several seasons showed the ester content to be only about one-half as great as the ester content of the oils from the California, Oregon, Washington, and New York hops." That the low ester content is responsible for the generally acknowledged superior aroma of imported hops could not be positively stated, but it is thought probable since other oils, like lavender and peppermint, are more fragrant than oils with a high ester content.

In the fractionation of the various oils, the data show that as a general thing, the oils from the California, Oregon, and Washington hops during the several seasons had a high content of low-boiling constituents, while the oils from the imported hops were invariably poorer in the low-boiling constituents. On the other hand, the oils from the imported hops seemed, generally speaking, to contain much higher percentages of the high-boiling compounds. The oil of the 1908 crop, however, was unique in that it appeared to be similar to the other oils during that particular season. The curves of the imported oils followed those of the New York oils the most closely, the general direction being similar. The California oils also followed very similar directions, as did the Oregon and Washington oils.

The fractions having the lowest specific gravities in all cases were those boiling below 185° C. This portion of the oil is usually supposed to contain most of the terpene constituents. The optical rotation of the various fractions of hop oil was very low. "The most noticeable feature was the tendency of the New York oil to follow the same course as the imported oil during each season. The curves of rotation, as well as the curves of fractionation, show some differences in the various oils, though perhaps in a lesser degree." The acid, ester, and saponification numbers of the fractions during each year were very variable.

From the results it is obvious that the oils which, in their original conditions, possess free acids (as indicated by the high acid numbers) show much more decomposition of ester with the liberation of free acids than do the oils

with less acidity or with none. With the acid values the ester numbers were very regular from year to year.

The approximate composition of hop oil is considered to be as follows: "Free acids.—Chiefly valerianic, with traces of formic, butyric, and heptoic acids: combined acids (in form of esters), chiefly heptoic (œnanthylic) and nonoic (pelargonic) and somewhat smaller quantities of octoic (caprylic), some decylic (caprinic) and undecylic acids, with traces of formic and acetic acids; aldehydes, formaldehyde in the lowest boiling fraction; hydrocarbons, myrcene (olefinic terpene), 30 to 50 per cent, humulene (sesquiterpene), 15 to 25 per cent; esters, chiefly heptoic, octoic, and nonoic acid esters of the alcohol myrcenol, to the extent of 20 to 40 per cent (from the ester number (44) of the oil in question the amount of esters calculated as the heptoic-acid ester of myrcenol was found to be 21 per cent); . . . alcohols, probably myrcenol and a small proportion of sesquiterpene alcohols."

"From the data presented it is clearly evident that the geographical source of hops has a pronounced effect upon the volatile oil and hence also upon the odor of the hops." The ester content is thought to be the most influential factor in modifying the odor of the oils and consequently that of the hops.

A review of previous chemical investigations is followed by a bibliography of cited literature.

About the occurrence of adenin and asparaginic acid in mulberry leaves, Z. MIMUROTO (*Jour. Col. Agr. Imp. Univ. Tokyo, 5 (1913), No. 1, pp. 63–65*).—Adenin and asparaginic acid were obtained from young air-dried mulberry leaves. In all probability the asparaginic acid is present as asparagin, as ammonia was evolved during the working up of the free ester. A peptone-like substance was obtained from the phosphotungstic acid precipitate.

About the occurrence of histidin betain in Boletus edulis, E. WINTERSTEIN and C. REUTER (*Hoppe-Seyler's Ztschr. Physiol. Chem., 86 (1913), No. 3, pp. 234–237*).—In work previously noted (E. S. R., 28, p. 501), a base having the formula $C_9H_{15}N_3O_2$ and found in the arginin fraction of *B. edulis* was discussed. The dipicrate of the histidin betain was compared with another dipicrate obtained by Barger and Ewins from ergothionin, and a study was also made of the monopicrate and gold salts of this compound. The two compounds are identical and represent histidin betain.

On some conditions affecting the activity and stability of certain ferments, J. H. LONG and W. A. JOHNSON (*Jour. Amer. Chem. Soc., 35 (1913), No. 7, pp. 895–913*).—It is suggested in this paper that starch paste for diastatic comparisons should be made from laboratory-prepared potato starch, sound and fully ripe potatoes being employed. Long washing and boiling of commercial starch will not always be sufficient to secure a suitable product. The amylolytic activity of pancreas preparations is best exhibited in a mixture containing about 25 mg. of sodium bicarbonate to 100 cc. of paste and ferment solution. Larger amounts of bicarbonate retard the reaction somewhat but do not appear to destroy the ferment, since the full rapidity of conversion may be recovered by the partial neutralization of the soda by weak hydrochloric acid. The addition of enough acid to convert all the soda to salt at once destroys the ferment, however.

"Glycerol extracts of the pancreas retain their amylolytic power through many months, but by dilution with water this activity is speedily lost. The loss of digesting power is very marked after a short incubation of the diluted extract at 40°, but if salt is present the destructive effect of incubation is much diminished. The effect of incubation of commercial preparations is much the same as with the glycerol extracts, and the presence of salt lessens the disturbing action of alkalis here, also.

"The pancreatic diastase is extremely sensitive to the action of traces of strong acids, which was shown by experiments with glycerol extracts and hydrochloric acid. Salt is a protection here, as before. The action of the acid is much more marked than is that of weak alkali, and neutralization with soda does not bring about recovery. Destruction of the enzym probably follows the contact with acid. The weak inorganic and organic salts present in all pancreas preparations are important factors in modifying the action of added acids, and doubtless, also, of added alkali. The behavior of phosphates may be of the first importance in this regard, especially in the commercial pancreatins, which are largely pancreas powders. Without the presence of these salts the addition of the slightest trace of acid would be doubtless much more marked and possibly destructive."

Inhibition of enzym action by lime-softened waters, O. BERGEIM and P. B. HAWK (*Jour. Amer. Chem. Soc., 35 (1913), No. 8, pp. 1049–1056*).—"Water softened by the use of lime was found to exert a pronounced inhibitory influence on the action of salivary and pancreatic amylases. This was due largely to the adsorption of the enzyms by colloidal magnesium hydroxid present in these softened waters.

"That the two enzyms used in these tests, salivary and pancreatic amylases, are not identical is indicated by differences shown in their response to the action of various ingredients contained in hard and softened waters."

The occurrence of maltase in cereals, Z. WIERZCHOWSKI (*Biochem. Ztschr., 57 (1913), No. 1–2, pp. 125–131*).—In some previous work it was shown that corn contains most of its maltase in an insoluble form. The investigation has now been extended to wheat, rye, barley, oats, millet, and buckwheat, corn being used for a comparison. All of the cereals were extracted with water until freed from diastase.

As regards the maltase content, the cereals can be conveniently divided into two groups. The first contains only small amounts of maltase and consists of rye, barley, wheat, and oats; the second group contains the cereals which have a large quantity of maltase and is made up of millet, corn, and buckwheat. Buckwheat and millet yield only small amounts of maltase when extracted with water.

The enzyms of the tobacco plant, J. DU P. OOSTHUIZEN and O. M. SHEDD (*Jour. Amer. Chem. Soc., 35 (1913), No. 9, pp. 1289–1309*).—A study is reported from the Kentucky Experiment Station as to the occurrence of enzyms in the Burley tobacco, from the Burley region, and the dark types grown in western Kentucky.

"It appears that invertase, diastase, emulsin, and reductases are present in appreciable amounts in the tobacco seed and in the leaf in all stages of its growth and after curing. Lipase, inulase, and a proteolytic enzym also seem to be present in small amounts, although in some cases the results are doubtful. The tests for enzyms in the soil were negative with one or two exceptions. Oxidases were found in the green leaf in all stages of its growth, gradually decreasing in amount from the topping stage to maturity, but no definite tests were obtained for this enzym in the cured leaf. A fairly good test, however, was obtained with guaiacum in the leaf cured with a green color, but here, as well as in the other cured samples, no tests were obtained with phthalin. This may be due either to the fact that the enzym has been used up in the cured leaf for oxidation purposes or that some interfering color prevented a positive test from being obtained.

"The fact that the quantitative tests for the amount of oxidase reaction show the smallest amount in the leaf at about the matured stage, taken in connection with the fact that the active extracts of the cured leaf which gave

no oxidase test with phthalin developed a deep red color on the addition of a drop of phenolphthalein, leads to the conclusion that the enzym has been used up in the curing process and is practically absent in the cured sample. The above is in harmony with Loew's work [E. S. R., 11, p. 727; 12, p. 545], since in several samples he obtained no test and in others only a slight test for oxidase in the different varieties of cured tobacco which he used in his work."

During the fermentation process losses occur which often amount to 15 per cent, and about one-fourth of this is considered dry matter. Among the gases formed during the fermentation period ammonia is easily detected in the fermentation room. During the fermentation process practically all the starch is hydrolyzed by diastase and the resulting sugar is changed into other substances by oxidation. The fact that good invertase reactions were noted led the authors to believe that possibly sucrose may be present and that this may be stored in the root and afterward translocated to the leaf and other parts of the plant during photosynthesis and growth. The protein content of the leaf decreases during the maturation period and this is due to proteolytic enzyms. Amino compounds are formed and the nitrate and nicotin contents of the leaf are decreased. A decrease in nitrates is brought about by the reductases which are present.

"Some enzyms perhaps have a rôle in the decrease of the resin and gums in fermentation. If this is true, such enzyms are very necessary, for it is believed that the aroma of a tobacco is partly due to the products formed from the gums and resins after these are broken down. The aroma may partly be due to the breaking up of the glucosids in the tobacco by the glucosid ferment forming an aromatic substance. It is of interest to note, in this connection, that some experiments have been made in this work using emulsin to prove the presence of a glucosid in the green and cured leaf . . . The results proved that there was a small amount of glucosid present. Furthermore, there is no doubt but that positive tests were obtained for a glucosid-splitting ferment.

"If there is a large amount of fat or protein present in the leaf these will create products during combustion which will injure the flavor and aroma of the tobacco. It is due to lipase and the proteolytic enzyms that these objectionable compounds are largely done away with, provided, however, that they have favorable conditions under which to accomplish their work.

"During the process of smoking an ethereal oil is formed from certain products of the sweat and from this may be due a portion of the flavor. Citric, malic, and oxalic acids are present in the cured leaf, although in smaller quantities than in the green leaf. Part of the citric and malic acids are perhaps transformed in the fermentation to acetic and butyric acids. Thus we see that there are many highly complex chemical changes taking place in the plant during its growth and these continue in the curing and fermentation periods. That the enzyms play a very important part in these changes can not be denied."

Micro-organisms in commercial lime-sulphur, C. A. PETERS and A. W. BROOKS (*Jour. Indus. and Engin. Chem., 5 (1913), No. 12, pp. 1013, 1014*).—Manufacturers of commercial lime-sulphur wash have been troubled for some time by the occasional thickening of their product. The consistency of the spoiled product resembled thin catsup and the precipitate consisted almost entirely of sulphur. When examined under the microscope, the mixture showed long threads which were identified as vegetable parasites closely allied to the group Beggiatoa. The use of secondhand wooden barrels is supposed to be the source of the contamination.

Comparison of the Kjeldahl-Gunning-Arnold method with the official Kjeldahl and official Gunning methods of determining nitrogen, T. C.

TRESCOT (*Jour. Indus. and Engin. Chem., 5 (1913), No. 11, pp. 914, 915*).—This is a comparative study of the Gunning-Kjeldahl and Kjeldahl-Gunning-Arnold methods for nitrogen. The materials studied were hair waste, dried blood, bone meal, leather, leather waste, cotton-seed meal, linseed meal, gelatin, cyanamid, beef extract, desiccated meat, flour, bread, gluten bread, macaroni, ground rye hay, shorts, bran, molasses feed, milk, condensed and evaporated milk, and cheese.

The conclusion reached from the results is "that the Kjeldahl-Gunning-Arnold method with 1½ hours' oxidation, except in the case of cyanamid, which requires 2½ hours, gives more concordant and reliable estimation of nitrogen than do the official Gunning or official Kjeldahl methods, both of which require from 3 to 4 hours for oxidation, depending upon the material."

The aluminum reduction method as applied to the determination of nitrates in "alkali" soils. P. S. BURGESS (*Univ. Cal. Pubs. Agr. Sci., 1 (1913), No. 4, pp. 51–62, fig. 1*).—In this paper the following points are emphasized:

"The aluminum reduction method[a] for the determination of nitrates in soils yields the most accurate results of all methods now commonly in vogue. Alkali salts do not in any way interfere with the successful operation of the method. The presence of extraordinarily large amounts of soluble organic materials (soluble humus and dextrose) have little effect on the method.

"A temperature of 20° C. for from 11 to 15 hours has been found the optimum for the reduction of large quantities of nitrates. The proper amount of NaOH to be employed in the reduction was found to be 2 cc. of a 50 per cent solution, with an aluminum strip weighing approximately 1 gm."

Mineralogical soil analysis. W. J. MCCAUGHEY (*Jour. Indus. and Engin. Chem., 5 (1913), No. 7, pp. 562–564*).—In this paper it is pointed out that the mineralogical analyses of soils are not usually made from the standpoint of the soil investigator. The value of such analyses is shown by numerous examples.

Determination of manganese in the soil. M. J. STRITAR (*Ztschr. Analyt. Chem., 52 (1913), No. 6, pp. 337–345*).—For soils containing a medium amount of calcium, the following method is proposed:

An extract is first made by treating 100 gm. of the soil with 25 per cent hydrochloric acid for 2 hours at 100° C. and then making up to 500 cc. Fifty cc. of this extract, is placed in a 200 cc. Kjeldahl flask with 25 cc. of concentrated nitric acid (preferably fuming). This is concentrated as far as possible by slow boiling, transferred to a porcelain dish, and evaporated to sirupy consistency on a sand or water bath. From 10 to 20 cc. of concentrated nitric acid is added to the residue and evaporated, this operation being repeated 3 successive times. The residue is then transferred with dilute nitric acid and water to a 100 cc. flask, cooled, and 1 to 2 drops of a sulphocyanid solution added (and when necessary 2 cc. of iron-alum solution) until a definite red coloration is present. The color is discharged with tenth-normal silver nitrate solution and restored with sulphocyanid solution. The solution is heated slightly, cooled, filled to the 100 cc. mark, and filtered.

Next, 25 cc. of the filtrate (free of chlorin and silver ions) is mixed with 17 cc. of nitric acid, cooled to 17 to 18°, shaken for 15 minutes with from 1 to 1.2 gm. of bismuth peroxid, cooled for from 2 to 3 minutes with cold water, filtered through an asbestos filter tube containing a porcelain filter disk into a 250 cc. flask, and the residue washed on the filter with cold water. The colored solution is then rapidly oxidized with about tenth-normal hydrogen peroxid solution and brought to a pink tint by the addition of tenth-normal potassium permanganate solution.

[a] Amer. Jour. Pub. Hyg., 19 (1909), No. 3, pp. 536–544.

Where n equals the titer of the hydrogen peroxid solution, t the amount of potassium permanganate in 1 liter, h the number of cubic centimeters of hydrogen peroxid used, and p the number of cubic centimeters of tenth-normal potassium permanganate used, the percentage of manganese in the soil is as follows:

$$X=\frac{40\times 50}{1{,}000\times 158.2}(h.n-p).t=0.0139(h.n-p).t.$$

When the manganese content of the soil is very low, or when very great accuracy is necessary, from 50 to 75 cc. of the filtrate can be concentrated to 30 cc., and after adding 20 cc. of concentrated nitric acid oxidation can be accomplished with bismuth peroxid. The above concentrations must be changed accordingly.

Further investigations with reference to the extraction process (the effect of cold, warmth, the use of hydrochloric acid or nitric acid, etc.) and the use of the method for soils rich in lime and for plant ashes are to be made.

Potash in mixed fertilizers, T. E. KEITT (*South Carolina Sta. Bul. 173 (1913), pp. 3–16*).—Some of this material has been noted (E. S. R., 28, p. 508).

The rendering insoluble of the potash when muriate of potash or kainit is mixed with slag is due to the formation of a compound which is almost entirely soluble in hydrochloric acid, sp. gr. 1.115. Some of the potash, as well as silica, ammonia-precipitable substances, and lime was dissolved by citric acid and ammonium citrate solution, sp. gr. 1.09. Potash was most soluble in the ammonium citrate solution, and the remaining substances were most soluble in the citric acid solution. Probably there is a substitution of the ammonia radical for potassium in the compound. There was no definite relation between any one of the other elements and the potash dissolved by the same solvent. The operation of separating the potash soluble in hydrochloric acid from other substances dissolved by the same solvent and precipitable by ammonia was found to be very tedious. The separation, however, may be accomplished by using large dilutions and making many precipitations.

"Basing our work on the difficulty of separating the potash present from the 'ammonia precipitate,' a study was made of the influence of the large 'ammonia precipitate' always present in the determination of potash in mixed fertilizers by our Official Method for solution.

"The results of this investigation show that there are two partially compensating sources of error in our Official Method of solution:

"(a) The volume is decreased by the bulk of the precipitate in the flask, which would tend to increase the percentage of potash present.

"(b) The potash is decreased by occlusion of potash by the heavy precipitate formed on addition of ammonia and ammonium oxalate. These two sources of error tend to balance to some extent.

"It is impossible to wash out the potash occluded within the precipitate with hot water.

"The occluded potash can be separated to a certain extent by repeatedly dissolving the precipitate in hydrochloric acid, diluting to a volume of about 400 cc., precipitating with ammonia and ammonium oxalate, and filtering to determine potash in the filtrates.

"The use of pure salts in making the solutions shows that both iron and calcium phosphate, when precipitated with ammonia, occlude potash, and that a combination of the two is even more effective to produce occlusion."

The detection of organic poisons (toxins and the like) in food, G. BARGER (*Pharm. Jour. [London], 4. ser., 37 (1913), No. 2609, p. 572*).—A paper read at the International Congress of Pharmacy at The Hague, 1913.

According to a summary, the author concludes "that the available chemical methods are of little value for this purpose. The isolation of putrefaction bases may be attempted, but it is very difficult. The ordinary methods for vegetable alkaloids are useless, as putrefaction bases are almost always insoluble in ether or chloroform. Special methods, such as precipitation with silico-tungstic acid, may be adopted, but the physiological action is the best test."

The quantitative estimation of gliadin in flour and gluten, G. A. OLSON (*Jour. Indus. and Engin. Chem., 5 (1913), No. 11, pp. 917–922*).—After reviewing the literature on this topic the author states that the methods which are used for the estimation of proteins in wheat flour are far from satisfactory. The strength of alcohol most suitable for the extraction of gliadin has never been determined.

"The gliadin nitrogen obtained by the indirect method is much lower than that obtained by the direct method, but agrees remarkably closely with the results obtained for nitrogen in the coagulum in the alcohol-soluble. Of the two methods for the estimation of gliadin, the coagulation method is the shorter and is more suitable to use for this reason than the indirect method. Alcohols ranging between 50 to 65 per cent, inclusive, by volume extract equivalent amounts of coagulum nitrogen. Above 65 per cent alcohol by volume there is a rapid falling off in the amount of coagulum nitrogen obtainable. Alcohol of 50 per cent by volume has been adopted by the writer for the determination of gliadin nitrogen. About 68 per cent of the total alcohol-soluble nitrogen is coagulable.

"Alcohol-soluble, incoagulable nitrogen is precipitated by phosphotungstic acid. This, together with the coagulable nitrogen, equals the total alcohol-soluble nitrogen. In the same flours as much coagulable nitrogen is obtained in specially prepared gluten as in case of the flour. The easiest and shortest method for the estimation of the gliadin in flour is to estimate the nitrogen in the uncoagulable portion of the alcohol-soluble and deduct this result from the total alcohol-soluble nitrogen."

The detection of chicory in decoctions of chicory and coffee, C. H. LAWALL and L. FORMAN (*Amer. Jour. Pharm., 85 (1913), No. 12, pp. 535–538*).—While at present there is no satisfactory specific test for detecting the presence of chicory in roasted coffee, it is possible by inferential tests to note this substance when present.

"A number of samples of roasted coffee of authentic origin were obtained covering all of the important commercial varieties. In these samples were determined, (1) the amount of extractive, and (2) the percentage of reducing sugars calculated in the extractive previously determined. The amount of extractive matter alone is inconclusive, of course, as no knowledge is usually obtainable concerning the ratio of ground coffee in the decoction." When, however, the ratio of the extractive substances to the reducing sugars present in the decoction is considered, a sharp line of demarcation exists by which it is possible to prove conclusively the presence of 5 per cent of chicory in ground coffee.

A coffee containing more than 3 per cent of reducing sugars in its extractive matter is looked upon as adulterated with chicory or with a similar product high in reducing sugars.

The detection of cane sugar in honey, C. H. LAWALL (*Amer. Jour. Pharm., 85 (1913), No. 8, pp. 376–378*).—"It is not possible to detect cane sugar in honey in the sense of a qualitative test. As cane sugar is normally present in small amounts, its quantitative determination, preferably by means of the polariscope, becomes necessary. The form in which sugar is added usually is

that of invert sugar which can be readily detected in honey which has never been subjected to heat."

Browne's test (E. S. R., 19, p. 1058) may serve as an aid but is not considered infallible.

Estimation of the fat content of milk with the aid of trichlorethylene, D. P. Ross van Lennep and J. D. Ruys (*Chem. Weekbl., 9 (1912), No. 32, pp. 654–657; abs. in Chem. Zentbl., 1912, II, No. 11, p. 962*).—The method is as follows: Boil 19 gm., or 9.7 cc., of milk for 2 minutes with 10 cc. of hydrochloric acid (specific gravity 1.19); cool, add 50 cc. of trichlorethylene, shake, allow the curd to settle, and draw off the supernatant trichlorethylene layer; and filter through a dry filter. Twenty-five cc. of the filtrate is evaporated in a tared beaker, and the residue dried for 45 minutes at 100° C. and weighed.

The properties of watered milk, E. W. Long and C. E. May (*Jour. Indus. and Engin. Chem., 5 (1913), No. 7, pp. 573–575*).—The results indicate that the Zeiss immersion refractometer method for examining milk serum is very practical for the detection of added water, but that when used alone it is not infallible. For every 10 per cent of water added to milk, the serum when prepared by the acetic acid method gives a refractometer reading about 2.9° lower than the unwatered milk, but the addition of 1 gm. of granulated sugar to 100 cc. of milk, watered or unwatered, will raise the refractometer reading of the serum about 4°. The adulteration of milk by watering and sugaring can therefore be carried on by adjusting the amounts of the adulterants and adding them to milk that is well above the standard in solids and fat. It therefore seems that "in examining commercial samples of milk it is well worth the chemist's trouble to look out for the presence of this form of adulteration."

The examination of the sediment obtained in the leucocyte test, with a description of a new leucocyte tube, V. Brudny (*Österr. Molk. Ztg., 21 (1914), No. 1, pp. 1–3, fig. 1; abs. in Cream. and Milk Plant Mo., 2 (1914), No. 6, pp. 25, 26*).—Milk samples which yield more than 0.1 per cent of sediment should be titrated for acidity, because it often happens that samples of this kind contain precipitated casein. The alizarol test of Morres is best for this purpose. It is also well to consider the presence of tubercle bacilli in the sediment and to make an animal test for the purpose of differentiating between nonpathogenic and pathogenic acid-fast bacteria. The presence of streptococci should also be considered, but it is often difficult to differentiate the pathogenic from the nonpathogenic forms.

The leucocyte test is considered the only simple method which we have for detecting mastitis in cows, but when noting the leucocytes the epithelial cells must not be counted as leucocytes.

A description and illustration are given of a special form of sedimentation tube, provided with a clamp which holds a removable cover at each end of the tube. This allows for the proper cleaning of the tube, especially at its capillary end.

Is the reductase test a valuable method for controlling the milk supply? H. M. Höyberg (*Ztschr. Fleisch u. Milchhyg., 24 (1913), No. 5, pp. 107–112*).—The test is not considered one with which the bacterial content of a milk can be determined with any degree of accuracy. The reduction of the dyes may be due to the formation, by abnormal or pathologic cellular metabolism, of certain substances which are secreted with the milk.

The fluidity of butter fat and its substitutes, G. F. White and R. H. Twining (*Jour. Indus. and Engin. Chem., 5 (1913), No. 7, pp. 568–573, figs. 4*).—In this article are presented the results of a series of viscosity measurements of various butter and oleomargarine samples and of mixtures of known composition. In addition to this the iodin number, saponification number, and

volatile acids were determined. The viscosimeter devised by one of the authors and Bingham, with some modifications, was used in the investigation.

"Oleomargarine fats are always more viscous than butter fats except, of course, where the viscosity of the former is greatly lowered by the introduction of large amounts of liquid fats as indicated by a chemical analysis. On standing, the viscosity of butter probably increases to a maximum due to a loss of volatile acids, and then becomes less viscous as putrefaction sets in.

"Although the viscosities for both fats vary somewhat in products from different sources, the fluctuation is always about a mean value which might be assumed without great error as a standard. The viscosities of the mixtures are not strictly additive. The fluidities are practically linear functions of the temperature. The fluidities of the mixtures are additive, so that these, and not viscosities, should be the basis for any comparison.

"Assuming that the fluidity of butter does not vary more than 5 per cent in value, an adulteration of 10 per cent oleomargarine can be detected with assurance."

The detection of gelatin in sour cream, A. SEIDENBERG (*Jour. Indus. and Engin. Chem., 5 (1913), No. 11, pp. 927, 928*).—The usual method for detecting gelatin in milk and cream consists in removing the proteins with acid mercuric nitrate and the precipitation of the gelatin in the filtrate with picric acid. It often occurs, however, that with a sweet cream no precipitate is noted. "It has been frequently noticed that a sweet cream which gave no precipitate with picric acid would, after souring, show quite a perceptible turbidity on its addition, often heavy enough to lead to the assumption that gelatin was present. It seems most probable that this is due to protein decomposition products not precipitated by the acid mercuric nitrate."

The picric acid precipitate from sour cream is flocculent and settles quite rapidly, while that due to gelatin is small and granular and on shaking in the tube will coalesce in large lumps and leave the solution almost clear. A marked difference was found between the precipitates as regards solubility in hot, neutral water; only the gelatin picrate is soluble in hot water.

A modification of the Official Method based on these findings is presented.

Sampling ice cream, J. O. HALVERSON (*Jour. Indus. and Engin. Chem., 5 (1913), No. 5, pp. 409, 410*).—It is shown that ice cream, as a rule, is not uniform in composition throughout the can, although this may not be noticeable except on the paddles of the freezer.

"In taking charges from preserved ice cream samples which have stood in a cooler so that the cream rises, perfectly uniform charges can not be obtained. This, it appears, causes a slightly greater variation in the fat reading with a tendency to run somewhat lower. The mixing of ice cream samples should be carefully performed, especially when they have stood so that the cream has risen to the top."

The modified Babcock for fat in sweetened dairy products—ice cream, J. O. HALVERSON (*Jour. Indus. and Engin. Chem., 5 (1913), No. 5, pp. 403–409, figs. 2*).—It is stated that the Babcock and the Adams-Soxhlet methods can not be used for determining fat in ice cream. The same is true of the modifications of the Babcock test, e. g. that of Leach and Farrington, used for sweetened condensed milk. Various volumetric and gravimetric methods (Röse-Gottlieb and Paul's gravimetric methods and Holm's and Howard's volumetric methods) suggested for this purpose are also deemed unsatisfactory, and the following modification of the Babcock method is proposed:

"To an 18 gm. charge add the usual sulphuric acid (specific gravity 1.82 to 1.83) in small portions of 3 cc. at a time, shaking after each addition with a slight pause. Continue adding acid in portions until a light amber brown color

or the color of coffee with cream in it, is obtained. Stand a few moments; then check the action of acid with 5 cc. of cold water with shaking. (This should be done before the solution becomes a deep dark brown or blackish color, which shows charring action on the sugar, which precipitate, if formed, is difficult to dissolve.)

"The solution having the color of coffee with cream in it, centrifuge 5 minutes; then add 5 cc. of boiling water, whirl one-half minute longer. Drain off the acid through the glass stopcock carefully by tilting the bottle (approximately 5 cc. of solution will be left). Dilute with cold water up to 10 cc. and shake; add acid in small portions as above, with shaking (approximately 8 to 10 cc.) until the remaining curd is dissolved or an almost coffee-black color, as in testing milk, is obtained. Add 3 cc. excess of acid and shake. Whirl 4 minutes; dilute to the neck with an acid solution, 3 parts of the sulphuric acid to 5 of water, at a temperature of about 60 to 70° C. Whirl 1 minute; then add boiling water up to zero or above and again whirl 1 minute more. Read the percentage of fat."

The results obtained were on the average 0.6 per cent low. "The percentage of residual fat in the drained portion averages the same as that lost in cream testing. The maximum variation in fat readings is not great considering that the variation is somewhat greater on samples which have stood some time and hence are not perfectly uniform. The variation with the modified Babcock compares favorably with the Röse-Gottlieb method. This method can be used in international centrifuges in food control laboratories if preferred, by using a separatory funnel with a graduated cream tube at the top. This method is also applicable to ice cream plants using the ordinary commercial sulphuric acid on hand. Likewise, a similarly modified 10 per cent milk test bottle can be used for determining fat in sweetened condensed milk."

A rapid method for the determination of fat in ice cream, H. F. LICHTENBERG (*Jour. Indus. and Engin. Chem., 5 (1913), No. 9, p. 786*).—The method is as follows:

"Weigh into a 10 per cent Babcock milk bottle 9 gm. of melted sample. Add 20 cc. of glacial acetic acid (specific gravity 1.049). Mix well and add 10 cc. of sulphuric acid (specific gravity 1.83). Mix again and proceed as in the regular Babcock test. With the aid of a pair of dividers read the fat column (from one extreme to the other; in other words, read the highest part of the meniscus which appears as a straight line when the bottle is held on the level of the eye and away from the source of light) at a temperature of 130° F. The result times 2 equals the percentage of fat."

A micro-chemical method for the determination of α- and β-amino acids and certain derivatives in proteolysis, bloods, and urine, P. A. KOBER and K. SUGIURA (*Jour. Amer. Chem. Soc., 35 (1913), No. 10, pp. 1546–1584*).—"The method (E. S. R., 26, p. 107) of forming copper complexes of amino acids, peptids, and peptones in neutral or slightly alkaline solution ($C_H = 10^{-7.07}$ to $10^{-8.8}$) has been improved so that quantitative results can be obtained in very dilute solution (1 part in 500,000). The 'precipitability' of the copper in the complexes of 19 amino acids, 27 dipeptids, 18 tripeptids, and 4 tetrapeptids is given, when in equilibrium with 0.06 normal $Ba(OH)_2$, and it is shown that the amount of copper dissolved by the free amino acid, as well as the amount dissolved by the peptids and peptones, can be separately determined, thus estimating these substances in micro-chemical mixtures.

"Experiments are given to show that under the conditions of this method very few other substances react with the reagent, and that these can easily be removed without interfering with the estimation of amino acids and their homologues. The method is applied to proteolysis, blood, and urine, and it is

shown that amino acids, peptids, and peptones can be estimated accurately and quickly in small amounts of material. It may, therefore, be called a 'clinical' method.

"Two very insoluble copper complexes, η-amino caproic acid and phenyl glycin copper, are found which may be useful in analytical work with copper. Ammoniacal lead acetate (5 cc. strong ammonia, specific gravity 90, to 25 cc. 10 per cent lead acetate) is shown to precipitate sugars, dicarboxylic acids, such as oxalic, citric, tartaric, and in moderate dilutions (1 part to 5,000) the amino acids, histidin, tyrosin, and tryptophan. Under the same conditions none of the other amino acids and [some] of the peptids are precipitated. In very dilute solution (1 to 25,000) this reagent does not seem to precipitate any amino acids.

"By means of the amino acids, η-amino caproic acid and phenyl glycin, the copper of all the other complexes, including those of the amino acids and all the polypeptids thus far studied with the exception of histidin, can be thrown down quantitatively. Therefore, by means of these reagents, we can determine histidin in very small quantities accurately and quickly."

METEOROLOGY—WATER.

Report of the Chief of the Weather Bureau, 1913 (*U. S. Dept. Agr., Weather Bur. Rpt. 1913, pp. 252, pls. 4*).—This contains an administrative report on work during the fiscal year ended June 30, 1913, and includes also tables giving a general summary of the weather conditions in the United States by months during the year 1912, annual summary of climatological data at the Canadian stations for 1912, list of observing stations and changes therein during 1912, sunshine in 1912, details of excessive precipitation in 1912, monthly and annual meteorological summaries for 1912, monthly and annual amounts of precipitation in 1912, and monthly and seasonal snowfall in 1912–13.

Monthly Weather Review (*Mo. Weather Rev., 42 (1914), No. 1, pp. 1–74, pls. 8, figs. 22*).—This is the first number of the Review under the reorganized plan of issuing this publication.

In accordance with this plan this number contains material classified as follows: (1) Aerology—data and discussions relative to the free atmosphere; (2) general meteorology—special contributions by any competent student bearing on any branch of meteorology and climatology, theoretical or otherwise; (3) forecasts and general conditions of the atmosphere; (4) rivers and floods; (5) bibliography—recent additions to the Weather Bureau library, and recent papers bearing on meteorology; and (6) weather of the month—summary of local weather conditions, climatological data from regular Weather Bureau stations, tables of accumulated and excessive precipitation, data furnished by the Canadian Meteorological Service, and monthly charts . . . as hitherto.

Such papers as have heretofore been published in the Bulletin of the Mount Weather Observatory will be incorporated in the Review, but "the voluminous tables of data and text relative to local climatological conditions that have during recent years been prepared by the twelve respective 'district editors' will be omitted."

This number contains articles on Atmospheric Transparency for Radiation, by F. E. Fowle; Pressure in Absolute Units, by W. N. Shaw; The Winds in the Free Air (illus.), by C. J. P. Cave; Meteorology as an Exact Science, by V. Bjerknes; Peculiarities of the California Climate (illus.), by G. F. McEwen (see p. 213); Lorin Blodget's Climatology of the United States, an Appreciation, by R. DeC. Ward; Is There an Auroral Sound? by J. Oxaal; The Mete-

orological Aspect of the Smoke Problem, by H. H. Kimball; New Daily Weather Map; The Weather Map on the Polar Projection; Winslow Upton, 1853–1914; The Drift of a Train of a Bright Meteor (illus.); Annual Meeting Royal Meteorological Society; Evolution of the Meterological Kite; Results of the Koch Expedition Across Greenland, 1912–13; and Freshets in the Savannah River and the Forecasting of High Water at Augusta, Ga. (illus.), by E. D. Emigh.

Monthly Weather Review (*Mo. Weather Rev., 42 (1914), No. 2, pp. 75–136, pls. 8, figs. 34*).—In addition to notes on weather forecasts for February, 1914, river and flood observations, lists of additions to the Weather Bureau library and of recent papers on meteorology, notes from the Weather Bureau library, the weather of the month, a condensed climatological summary, and climatological tables and charts, this number contains the following articles:

Italian Twilights of 1913, by I. Galli; Twilight Colors at Mount Weather, Va., in 1913, by H. H. Kimball; Recent Balloon Experiments, by C. G. Abbott; The Effect of Weather upon the Yield of Corn (illus.), by J. W. Smith (see p. 229); Unpublished Contributions to the International Meteorological Congress Held at Chicago, August, 1893; On the Theoretical and Practical Importance of a Series of Daily Weather Charts of the Northern and Southern Hemispheres, by H. Wild; A Classification of the Methods of Transition from Rain to Blue Sky (illus.), by W. I. Milham; Squalls and the Prediction of Tornadoes (illus.), by E. Durand-Gréville; Evaporation from Snow and Errors of Rain Gage when used to Catch Snowfall (illus.), by R. E. Horton; Daily Synoptic Charts of the Northern Hemisphere and Absolute Units, by W. N. Shaw; The Japan Current and the Climate of California, by W. G. Reed; [Artificial Snowfall in a Train Shed]; [Mild Winter of 1913–14 in England]; On the Amount of Evaporation, by Y. Horiguti; Prevention of Fog; Do Clouds Yield Snow Easier than Rain? by D. F. Manning; and The Value of Weather Forecasts in the Problem of Protecting Forests from Fire (illus.), by E. A. Beals.

Climatological data for the United States by sections (*U. S. Dept. Agr., Weather Bur. Climat. Data, 1 (1914), Nos. 1, pp. 238, pls. 2, figs. 4; 2, pp. 248, pls. 2, figs. 7*).—In accordance with the new plan of publication of meteorological and climatological data noted above these volumes contain brief summaries and detailed tabular statements of climatological data for each State for January and February, 1914.

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. Ostrander and E. K. Dexter (*Massachusetts Sta. Met. Buls. 303, 304 (1914), pp. 4 each*).—Summaries of observations at Amherst, Mass., on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during March and April, 1914, are presented. The data are briefly discussed in general notes on the weather of each month.

Peculiarities of the California climate, G. F. McEwen (*Mo. Weather Rev., 42 (1914), No. 1, pp. 14–23, figs. 13*).—The peculiarities of the California climate are discussed on the basis of general principles of atmospheric and oceanic circulation. It is stated that "the climate of that part of California lying between the coast and the mountains is largely controlled by the surface temperature of the adjacent ocean, and consequently agrees at any place with the normal marine climate of that latitude in winter. But in summer, when the upwelling is so pronounced as to reduce the surface temperature of the inshore water much below the normal, a coast climate, peculiar in many respects, is produced, the remarkably low summer temperature being the most striking peculiarity."

A bibliography of references to literature relating to the subject is given.

The floods of 1913 in the rivers of the Ohio and lower Mississippi valleys, A. J. HENRY (*U. S. Dept. Agr., Weather Bur. Bul. Z (1913), pp. 117, pls. 22, figs. 3*).—This bulletin reports on the floods of March and April, 1913, in the States of Ohio and Indiana and on the resulting floods in the Ohio and Mississippi rivers, compares these with floods of previous years, and gives a number of tables, diagrams, and illustrations.

The March, 1913, flood is attributed to the existing meteorological conditions previously reported (E. S. R., 29, p. 510) which show that in the space of 72 hours 7.5 in. of rain fell. Conclusions as to flood frequency in the Ohio River are that it "is primarily due to the distribution of precipitation as regards both time and space, and that there is urgent need of accurate measurements both of precipitation and stream flow for the next 50 years or longer before conclusions the one way or the other may be reached."

Detailed reports on the 1913 floods by districts are as follows: Precipitation and Floods in Ohio, March, 1913, by J. W. Smith; The Flood at Dayton, Ohio, by H. C. Alps; The Flood at McConnellsville, Ohio, by C. H. Morris; Flood in the White River of Indiana, March, 1913, by C. E. Norquest; Flood in the Wabash River of Indiana, March, 1913, by W. R. Cade; Flood in the Illinois River, by M. W. Hayes; The Flood in the Ohio River in the Louisville District, by F. J. Walz; The Flood in the Ohio River in the Evansville District, by A. Brand; The Flood in the Mississippi River in the Memphis District, S. C. Emery; The Floods in the Mississippi River in the Vicksburg District, W. E. Barron; Floods in the Arkansas and White Rivers of Arkansas, by H. F. Alciatore; Floods in the Mississippi River below Vicksburg, and in the Atchafalaya River in the Spring of 1913, by I. M. Cline; The Flood in the Hudson River, March, 1913, by G. T. Todd; Floods in New York State, by R. E. Horton; Supplemental Note on Frequency of Recurrence of Hudson River Floods, by R. E. Horton; and Floods in the Connecticut Valley and in Vermont, March, 1913, by W. W. Neifert.

The weather of the past agricultural year, F. J. BRODIE (*Jour. Roy. Agr. Soc. England, 74 (1913), pp. 430–439*).—The character of the season is described and meteorological data relating to rainfall, temperature, and sunshine for different parts of the British Isles are reported.

The effect of climate and weather on the soil, E. J. RUSSELL (*Jour. Roy. Agr. Soc. England, 74 (1913), pp. 1–21, pls. 3, fig. 1*).—This article discusses the effect of climate on the formation of the mineral framework of the soil and on the organic matter of the soil; soil losses; the correlation of soil belts and climatic zones; the effect of weather (seasonal variations) on the soil and the crop; and the means of overcoming the effetcs of a bad season.

It is shown that climate plays a great part in determining the general character of the soil as regards both its mineral framework and its organic constituents, but that the general character may be modified considerably from year to year by variations of season or weather. The ways in which this is done are considered in some detail. The three groups of injurious effects of a bad season considered are (1) injury to the texture of the soil, (2) interference with the preparation of available plant food, and (3) loss of nitrate. Systematic catch cropping or green manuring is suggested as a hopeful method of overcoming these difficulties.

Water conservation, W. MCCULLOH (*New Haven, Conn., and London, 1913, pp. X+99, pls. 22, figs. 18*).—This consists of a set of lectures on water storage conservation, discussing (1) basic data essential to a comprehensive study of water storage, (2) water power, (3) water storage for water supplies, sanitation, and irrigation, and (4) the water resources of New York State.

SOILS—FERTILIZERS.

The natural scientific basis for agricultural technique. E. FEIGE (*Naturwissenschaften, 1 (1913), No. 52, pp. 1305–1307; abs. in Chem. Zentbl., 1914, I, No. 8, p. 806*).—This is a brief discussion of factors in soil cultivation, physical properties of soil, importance of humus and of fertilizers, and the food requirements of crops, which points to the importance of a thorough knowledge of natural occurrences in connection with cultural measures for improving growth conditions.

Testing soils in the laboratory and field, W. H. STEVENSON and P. E. BROWN (*Iowa Sta. Circ. 15 (1913), pp. 2–16, fig. 1*).—This circular gives a list of questions for the farmer to answer regarding the lay of his land, the crops grown, fertilizers added, etc., to enable the station to advise him as to the proper treatment of the soil; describes the litmus paper test for soil acidity and the hydrochloric acid test for carbonates; presents the details of field tests to determine the fertilizer requirements of soil for both live stock and grain farming; and gives miscellaneous information regarding commercial fertilizers.

Composition and agricultural value of the arable lands in Argentina, P. LAVENIR (*Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), Nos. 1, pp. 9–18; 2, pp. 145–154*).—The physiography and representative soil types of the agricultural area of Argentina are described, physical and chemical analyses of soils reported, and the soils discussed as regards fertility and crops.

This area is an immense plain, a large part of which is arid. The soils are deep, rather fine alluvial beds with a variable clay content and range in texture from heavy to very light. They are usually well supplied with fertility constituents except lime. In one or two localities, however, the soils are high in lime and low in organic matter and nitrogen, and in some cases phosphoric acid. The subsoils are more or less impervious except where the soils are very light and contain much lime. The soils of many of the more arid localities contain injurious amounts of alkali, and irrigation is a quite frequent and necessary practice.

Alkali lands, L. T. SHARP (*Better Farming [Univ. Nev.], 1 (1913), No. 4, pp. 4–8*).—This is a brief discussion of the subject containing analyses showing fertilizing constituents and alkali salts in 50 samples of Nevada soils.

[Nitrogen supply of the Indian soil], C. M. HUTCHINSON (*Ann. Rpt. Bd. Sci. Advice India, 1912–13, pp. 123–126*).—Azotobacter was found in all Indian soils examined. Pure cultures of *A. chroococcum* from soils of widely different character "exhibited nitrogen fixing power very similar to that recorded from European strains, its physiological activity depending upon appropriate supplies of water, air, lime, and especially of carbohydrate food."

In experiments with green manures it was found that the successful use of such manures depended almost entirely upon the moisture conditions following the turning under of the crops. "Laboratory experiments showed that the nitrate formed from the buried plant tissues increased in amount up to the end of eight weeks from the time of turning into the soil, provided the water supply was kept up to at least 16 per cent of the soil weight, but after this period a steady diminution took place, so that after twelve weeks a smaller quantity of nitrate than that present at the end of the eighth week was invariably found."

To avoid the loss due to insufficient moisture in the soil and to hasten the initial stage of decomposition the crops were cut, steeped in water, and allowed to ferment in heaps, the fermented material being used in the same way as barnyard manure. "The advantages of this method, in addition to the principal

one of eliminating the uncertainty of the rainfall as a factor in decomposing the buried green material, include the possibility of applying the fermented manure at the best rate per acre and at the best time for producing its optimum manurial effect; at the same time it is not necessary to grow the green manure crop on the land which is to carry the . . . crop intended to benefit by its manurial effect."

Brief reference is made to a modified method of biological analysis of soil in which the biological activities are studied with large samples (400 to 1,200 gm.) of soils instead of with 1 gm. samples as is the method commonly employed.

Experiments on the lateral percolation of contamination in soil, O. Bail and F. Breinl (*Arch. Hyg., 82 (1914), No. 1, pp. 33–56, figs. 7*).—Experiments on the lateral percolation of contaminated liquids in soils of different mechanical and physical structures are reported.

Percolation was more or less influenced by the soil structure as regards size of soil grain, pore space, permeability, nature of stratification, and moisture content. In tests of both short and long duration, using small and large apparatus and correspondingly large and small soil samples, the soil section being dampened assumed the shape of a more or less irregular triangle, whose base was the wall at the entrance of the liquid to the soil, and whose apex was the most distant point of lateral percolation. Where downward infiltration was unhindered the lateral percolation attributed to the pressure head was small, but when constantly hindered by an impervious layer a horizontal sheet of contaminated liquid was formed. With increasing depth of downward infiltration, due to gravity, the lateral spread of the contaminated surface due to capillarity was very marked. Contaminated liquids were purified to a limited degree through filtration and absorption by soils.

It is concluded that if downward infiltration is unhindered the danger of pollution of the ground water lies in the resulting lateral spread of the contaminated surface due to capillarity.

The effect of hydroxyl ions on clay and clay soils in marling, J. G. Maschhaupt (*Landw. Vers. Stat., 83 (1914), No. 5–6, pp. 467–470, pl. 1*).—The author maintains that the flocculating effect of calcium hydroxid on clay suspensions is due principally to the calcium ion rather than to the hydroxyl ion. He found that both sodium hydroxid and sodium carbonate solutions had a flocculating effect on clay suspensions only in strong concentrations and when very dilute had a stabilizing effect, while calcium hydroxid had a flocculating effect when both dilute and concentrated. He concludes, therefore, that the flocculating effect of calcium hydroxid and sodium hydroxid can not be attributed entirely to the same causes.

Studies of plant growth in heated soil, G. W. Wilson (*Biochem. Bul., 3 (1914), No. 10, pp. 202–209, pls. 3*).—Pot experiments with buckwheat, wheat, rye, and barley, using a very poor loam soil which had previously been heated to 95, 135, and 175° C., are reported.

The growth and vigor of all the crops, particularly the buckwheat, were accelerated on soil which had been heated to 95°, but were retarded on soils heated to 135 or 175°, especially the latter. Plants grown on heated soil were more susceptible to attack by parasitic fungi than those grown on unheated soil, and soil fungi grew more abundantly on soils which had been subjected to high temperatures.

It is concluded that "the effect of heating soils upon the crop grown varies with the temperature to which the soil is subjected, the kind of soil used, and the nature of the crop grown upon it."

See also a previous note by Bouyoucos (E. S. R., 29, p. 618).

The determination of the fertilizer needs of soils by the aid of chemical soil analysis, O. LEMMERMANN (*Landw. Vers. Stat., 83 (1914), No. 5–6, pp. 345–358; abs. in Ztschr. Angew. Chem., 27 (1914), No. 37, Referatenteil, p. 298*).—The author is of the opinion that the available plant food in soils, and consequently their fertilizer needs, is not exactly indicated by the amount of plant food soluble in water saturated with carbon dioxid according to the Mitscherlich method of chemical soil analysis. He maintains that this is influenced by other factors such as organic acids, soil bacteria, climate, etc.

The determination of the fertilizer needs of soils by the aid of chemical soil analysis, E. A. MITSCHERLICH (*Landw. Vers. Stat., 83 (1914), No. 5–6, pp. 401–408*).—The author defends his views regarding the value of chemical analysis of soils in determining the fertilizer needs of soils, but emphasizes the importance of a plant physiological basis for all such analyses.

Estimating the fertilizer need of soil, E. A. MITSCHERLICH (*Fühling's Landw. Ztg., 63 (1914), No. 3, pp. 75–78*).—The author points out the inaccuracy of Liebig's law of minimum as applied to the results of fertilizer experiments, in that the increase in crops due to fertilizing is not an exact indication of the fertilizer need of soils owing to the fact that all other environmental factors exert an influence on the increase in crop and must be kept constant in order to determine the effect of varying amounts of a particular element. To obtain constant factors of environment in pot experiments the different soils were kept at their full water capacity during the entire vegetation period. Of 8 samples of each kind of soil, 4 were treated with a 1 to 2 per cent nutritive solution without phosphoric acid, and 4 with a 1 to 2 per cent nutritive solution containing phosphoric acid. The success was very limited, owing to the tenacity of the soils, but where successful the phosphoric acid deficiency was indicated by the reddening of the oats plants, it being greater the deeper the color.

The behavior of common and improved varieties of plants toward artificial fertilization, F. MASS (*Kali, 7 (1913), p. 611; abs. in Chem. Abs., 8 (1914), No. 7, p. 1322*).—"The experiments were carried out on stony ground which was fertilized as follows: 0, 3, 6, and 8 kg. superphosphate; 0, 1, ½, 3, and 4 kg. potassium salts; 1, 0, 2, and 3 kg. Chile saltpeter per 100 square meters. Four varieties of barley, 3 of oats, and 2 of summer rye were used in the experiments. The results show that on land that is wanting in plant food the common varieties yield better crops, while with fertilized land the improved varieties are more productive."

Maintenance of soil fertility: Plans and summary tables (*Ohio Sta. Circ. 144 (1914), pp. 63–97, fig. 1*).—This is one of the annual statements on the subject (E. S. R., 29, p. 213), bringing the data for the experiments at Wooster and Strongsville up to the end of 1913 and summarizing the results for 20 years (1894–1913) at Wooster and 19 years (1895–1913) at Strongsville.

Soil fertility, G. ROBERTS (*Kentucky Sta. Ext. Circ. 11, pp. 16*).—This is a popular discussion of the fertilizer requirements of crops and soils and of the best methods of using fertilizers. Reference is made to an experiment which indicated "that in beginning the restoration of a badly worn soil deficient in phosphorus, it is best to use an application of acid phosphate in growing a cowpea crop to be turned under with a liberal application of raw ground phosphate rock, to be followed with clover as soon as possible. Clover seems especially able to utilize the rock phosphate. The clover turned under, pastured, or fed, and the manure returned, furnishes available phosphorus, as well as nitrogen, for succeeding crops. On soils fairly well supplied with organic matter, rock phosphate may be used to begin with."

Pot culture experiments, 1913, J. A. VOELCKER (*Jour. Roy. Agr. Soc. England, 74 (1913), pp. 411–422, pls. 5*).—These included experiments in continuation of those of previous years (E. S. R., 29, p. 520) on the influence of various metallic salts (zinc, copper, manganese, and cerium) on wheat and on the relation of lime to magnesia in soils, as well as experiments with sulphur as a fertilizer and on the effect on tomatoes of adding lithium phosphate and magnesia to natural and heated soils.

From the results of the pot experiments to test the influence of zinc salts it was concluded "that the addition of zinc up to 0.01 per cent will have, on the whole, a stimulating result and produce better tillering, but that above this amount the influence will be one of a toxic nature. In the form of nitrate the metal will be more active than in that of carbonate or of phosphate."

In studying the influence of copper salts on wheat it was found in pot experiments that "when sulphate of copper was used 0.1 per cent of the metal was absolutely destructive of the plant and 0.05 per cent nearly so; 0.02 and 0.01 per cent, however, showed stimulating action, more corn and more straw being alike produced. In smaller amounts copper appeared to have no action. With the carbonate the results were much the same, though not quite so strongly marked. . . . With the heavy dressing of copper, as sulphate, the roots went down only 1½ in. into the soil. With 0.05 per cent they were but little better, but with 0.02 per cent there was a great change visible, and an extensive and very fibrous root growth was produced. With 0.01 and lower quantities the root was much like that of the untreated plants. Carbonate of copper gave similar results, though not so marked."

Manganese and cerium salts are reported to have shown no indication of stimulation or of toxic effect with wheat plants.

Experiments upon the relation of lime and magnesia in soils showed an injurious effect when magnesia predominated, but when lime was in excess no such effect was produced.

No influence could be detected with mustard, rape, and clover by the application of flowers of sulphur at the rates of 3, 6, and 12 cwt. per acre as a fertilizer.

The results of the experiments with tomatoes indicated that lithium phosphate in amounts of from 0.0025 to 0.005 per cent and magnesia in amounts of from 0.792 to 1.584 per cent were toxic to the plants, the toxic effect being much more decided with tomatoes than with wheat. It was not clear from the results whether the effect of these substances was due to their action upon the bacterial nature of the soil.

Manurial experiments (*Bd. Agr. and Fisheries [London], Misc. Pub. 17 (1914), pp. 22*).—In this publication directions, originally drawn up in 1903 by the Agricultural Education Association of England, for making simple fertilizer experiments are given.

The plans include experiments to show the manurial necessities of the soil as well as the fertilizer requirements of meadow land, permanent pasture, rye grass and clover hay, ruta-bagas, mangolds or cabbages, potatoes, wheat, oats, and barley. Directions are also given for the use of lime in the prevention of finger-and-toe disease, and a method of reporting results is outlined. Duplicate plats are arranged for each treatment, these duplicates being as widely separate in the plan of experiment as possible.

The mixing of fertilizers, K. DIEM (*Meded. Deli-Proefstat. Medan, 8 (1914), No. 4, pp. 112–117, pl. 1*).—This article discusses the mixing of fertilizers and shows how to prepare mixtures of a given composition, explaining also what substances may and what should not be combined in a fertilizer mixture.

The topographic features of the desert basins of the United States with reference to the possible occurrence of potash, E. E. FREE (*U. S. Dept. Agr.*

Bul. 54 (1914), pp. 65, pls. 6).—The location, topography, and extent of the undrained basins of the United States are discussed with reference to conditions indicating the possible occurrence of workable deposits of potash in accordance with the "desert basin" or "dry lake" potash theory which is based upon three simple propositions, viz: "(1) Rocks and soils give up various salts, including those of potassium, to drainage waters which flow over them. (2) In areas of inclosed drainage these salts, still including those of potassium, are concentrated wherever the waters evaporate. (3) In this concentration the salts of potassium may have been sufficiently segregated from other salts to form a workable deposit."

The bulletin deals in general with the Great Basin and its development, and discusses in detail the following groups of undrained basins: The Lahontan Basin and its tributaries, the Bonneville Basin and its tributaries, the basins of the Lava Plateau, the trough valleys of Nevada and the basins of the Transition Zone, the trough valleys of California and the Mojave Desert, the Salton Basin, the basins of the New Mexico-Texas trough, the trough valleys of Arizona and Sonora, the Lordsburgh-Membres region (New Mexico) and the Chihuahua bolsons, the Rocky Mountain basins, the Great Valley of California, the filled lakes of the California ranges, the basins and ponds of the Colorado Plateau, the ponds and coulées of eastern Washington, the ponds of the Great Plains, and local basins of unusual origin.

Nearly 200 basins are referred to but in only the following are all the known conditions favorable to the accumulation of potash deposits: Lahontan, 45,730 square miles; Death Valley, 23,560; Railroad Valley, 6,340; Searles, 4,850; Alvord, 3,200; Diamond, 2,800; Surprise, 2,350; Dixie, 2,290; Warner, 2,000; Panamint, 1,950; Hualpai, 1,450; Columbus, 1,350; Gabbs, 1,280; Edwards Creek, 990; Kane, 900; Ivanpah, 900; Saline, 845; Eureka, 775; Mono, 770; Frenchman Flat, 740; Gold Flat, 640; Opal Mountain, 580; and Clayton, 550.

In the following some of the known conditions are unfavorable to the accumulation of potash but they can not be definitely rejected: Salt Basin, 8,600 square miles; Owens, 2,825; Estancia, 2,100; Spring Valley, 1,550; and Chewaucan (Albert Lake), 1,500. The following are classified as doubtful: Salton, 8,000 square miles; Danby Lake, 4,150; Red Desert, 3,600; Christmas Lake, 2,750; Bristol Lake, 2,520; Catlow, 2,000; Penoyer, 1,000; Guano Lake, 1,000; Emigrant (Timpahute), 1,000; Madeline, 900; and Rhodes, 670.

Presumed luxury consumption of potassium and phosphoric acid, J. Lende-Njaa (*Separate from Meddel. Norske Myrselskap, 1912, No. 5, pp. 65; abs. in Zentbl. Agr. Chem., 42 (1913), No. 12, pp. 816–824; Chem. Abs., 8 (1914), No. 7, p. 1322*).—"In general the percentage of a constituent in plants is increased if the plants are fertilized with the particular fertilizer. For every soil and every plant there is a limit of fertilizing beyond which there is luxury of consumption. The limit generally agrees with the limit for the profitable employment of the fertilizer.

"The danger of luxury consumption is greatest in case of one-sided fertilizing. It may occur for potassium and phosphoric acid in complete fertilizing but only when the quantities are used in much greater amounts than in one-sided fertilizing. The amounts of valuable plant food which the ordinary culture plants take from the soil in luxury consumption are considerably greater in case of potassium than for phosphoric acid. A moderate amount of potassium nitrate used in addition to dipotassium phosphate lessens the percentage composition of potassium and phosphoric acid in the harvest and also the danger of luxury consumption. If potassium nitrate is increased until the plant tends to lodge there occurs a luxury consumption of potassium and phosphoric acid."

The brown and blue phosphate rock deposits of south-central Tennessee, J. S. HOOK and L. P. BROWN (*Resources Tenn., 4 (1914), No. 2, pp. 51–86, pl. 1, figs. 12*).—This paper discusses "the extent of individual fields, the methods of mining, and the preparation of the phosphate for market, its uses, etc. . . . There are three distinct varieties of phosphate rock in Tennessee, known commercially as: (a) The 'brown' rock; (b) the 'blue' rock; and (c) the 'white' rock. Of these, only the first two are being exploited at the present time, and are here given attention."

The total production in 1912 was 423,331 long tons. The phosphate is sold under guaranty of from 70 to 80 per cent of tricalcium phosphate with not more than from 4 to 6½ per cent of combined iron and alumina.

The influence of lime in the form of caustic lime and carbonate on the physical properties of different kinds of soil, O. ENGELS (*Landw. Vers. Stat., 83 (1914), No. 5–6, pp. 409–466, fig. 1; abs. in Ztschr. Angew. Chem., 27 (1914), No. 37, Referatenteil, p. 298*).—From the investigations reported the author concludes that on the addition of lime to the soil the colloids are precipitated and a crumbly structure is produced. The water capacity and the permeability of the soil for water is at the same time increased, and to a greater extent in heavy soils than in light.

The capillary rise of water in the soil as well as the hygroscopicity were decreased by liming, the reduction in the latter case being greater the larger the proportion of clay and fine particles.

The ease of cultivation was decidedly increased by liming, the effect in this respect increasing with the compactness of the soil and the amount of clay and fine particles present. The shrinkage of the soil was very decidedly reduced by liming, particularly in the case of soil containing a large amount of clay and fine particles.

Injurious effect of heavy applications of lime on upland moor soils, DENSCH and ARND (*Centbl. Bakt. [etc.], 2. Abt., 40 (1914), No. 1–8, pp. 83–87*).—Investigations in continuation of those already noted (E. S. R., 29, p. 832) gave results confirming the authors' previous conclusions, and further emphasized the fact that the formation of nitrite when heavy applications of lime are made on moor soils is due to biological rather than chemical action since only traces of nitrite were found when the soil and the lime were carefully sterilized.

The action of sulphur on plant production, as well as the agreement of the results of field experiments with Gauss's law of probability, T. PFEIFFER and E. BLANCK (*Landw. Vers. Stat., 83 (1914), No. 5–6, pp. 359–383, fig. 1; abs. in Ztschr. Angew. Chem., 27 (1914), No. 37, Referatenteil, p. 298*).—Investigations by others on the fertilizing effect of sulphur are reviewed and field experiments in which sulphur was applied at the rate of from 267 to 524 lbs. per acre to oats on a heavy loam soil are reported.

The results indicated that the applications of sulphur increased neither the plant growth nor the utilization of the soil nitrogen; in fact, in many cases the opposite result was obtained in both respects. In the author's opinion the very favorable results following fertilizing with sulphur reported by other investigators are to be accepted with caution in view of the faulty methods of experimenting used.

The applicability of Gauss's law of probability to the results of field experiments is discussed and in the authors' opinion confirmed.

Manganese in the living organism and its agricultural applications, LEPERCQ (*Mém. Acad. Sci. Lyon, 3. ser., 13 (1913), pp. 177–192*).—This article discusses the diffusion of manganese in plants and animals, the relation of manganese to enzyms, and manganese fertilizers, incidentally referring to some

of the more recent theories of soil fertility and especially to the possible beneficial effect of manganese salts in aiding the functioning of the oxidases.

Compensation for the unexhausted manurial values of feeding stuffs and fertilizers, J. A. VOELCKER and A. D. HALL (*Jour. Roy. Agr. Soc. England, 74 (1913), pp. 104–119; abs. in Mark Lane Express, 111 (1914), No. 4306, p. 539*).—A revision of tables, last published in 1902 (E. S. R., 14, p. 1057), is reported and discussed. The revision was rendered necessary by the recent rise in prices of fertilizing materials, more particularly of those furnishing nitrogen, and by the growing conviction that the spreading of compensation over a period of four years is alike inconvenient and not borne out by recent investigations nor in actual agricultural practice. In the revision, therefore, the unit value of nitrogen is taken as 15 s. ($3.65) instead of 12 s. ($2.92) as formerly, and the compensation extends only to one crop after the fertilizing material is applied. The prices for potash and phosphoric acid as used in the computation of the table remain unchanged.

AGRICULTURAL BOTANY.

Studies in plant physiology, P. MAZÉ (*Ann. Inst. Pasteur, 25 (1911), No. 10, pp. 705–738, pl. 1, figs. 12; 27 (1913), Nos. 8, pp. 651–681, pl. 1; 12, pp. 1093–1143, pls. 2, figs. 6; 28 (1914), No. 1, pp. 21–68, pls. 4, figs. 8*).—This is a series of memoirs in which the author attempts to establish the normal behavior of the roots of the higher plants and the mineral nutrition of plants in relation to a rational system for the use of fertilizers. Most of his experiments were carried on with maize, but various phases of the study were extended to other plants to confirm the results obtained. Among the various topics discussed are absorption and excretion of mineral substances by the roots and leaves of plants, excretion of organic materials, relation of the constitution of nutrient solutions to the mineral content of maize, storing mineral substances in different parts of the plant, effect of incomplete solutions on the ash of maize, absorption of organic matter and its use by the plant, the law of minimum in its physiological relations, the rôle of water in plants, the mechanism of absorption, the function of root secretions, conditions for fruiting of maize grown in aseptic solutions, influence of various compounds on the development of maize, chlorosis in maize, etc. Some of these topics have already been reported upon (E. S. R., 25, p. 224; 27, p. 721; 29, p. 826).

Notes on the technique of the determination of the depression of the freezing point of vegetable saps, R. A. GORTNER and J. A. HARRIS (*Plant World, 17 (1914), No. 2, pp. 49–53*).—A description is given of a method devised by the authors for the rapid study of the depression of the freezing point of vegetable saps. This method was successfully used in determining specific gravity, total solids, freezing point depression, and electrical conductance of more than 800 samples in about 2 months' time.

Utilization of solar energy by green plants, A. PÜTTER (*Naturwissenschaften, 2 (1914), No. 8, pp. 169–175*).—Results are given of experiments in which the utilization rate of solar energy by various plants is said to have ranged from 0.27 to 5.24 per cent of that incident on the green leaves employed.

The influence of humidity and dryness on the anatomical structure of two tropical plants, P. CHOUX (*Rev. Gén. Bot., 25 (1913), No. 292, pp. 153–172, figs. 16*).—Giving results of a study regarding the external appearance, internal structure, etc., as related to seasonal humidity in case of *Ipomœa reptans* and *Neptunia prostrata*, the author states that the differences are marked as regards dimensions, color, and resistance. It is noted that in dry seasons the vascular

and fibrous systems are little developed, and the medullary lacunæ are smaller and thicker walled than in wet seasons.

Recent studies on respiration in tropical plants and on coloration of organs, F. TOBLER (*Naturwissenschaften, 2 (1914), No. 9, p. 215*).—Noting recent results of investigations as reported by Kuyper, Plester, and Hill, jr. (E. S. R., 26, p. 822; 28, p. 728; 29, p. 538), the author holds that while a direct parallel between respiration rate and chlorophyll content has not been established, a relation doubtless exists between respiration and assimilation.

A method of studying transpiration, F. DARWIN (*Proc. Roy. Soc. [London], Ser. B, 87 (1914), No. B 595, pp. 269–280, figs. 9*).—The author describes and gives an account of experiments on transpiration, the investigation being conducted with leaves of the cherry laurel, the stomata of which had been blocked by a coating of cacao butter or vaseline and communication with the intercellular spaces of the leaves taking place through incisions made in the leaves. The rate of transpiration was estimated by a potometer.

The relation between transpiration and humidity in a number of experiments is shown by curves which indicate that transpiration for different degrees of relative humidity is roughly in a straight line. From this it is inferred that a definite relation exists between transpiration and relative humidity. Another characteristic brought out by the curves is the fact that transpiration in saturated air is not zero.

The effect of light on the transpiration of leaves, F. DARWIN (*Proc. Roy. Soc. [London], Ser. B, 87 (1914), No. B 595, pp. 281–299*).—Employing the method described above, the author has studied transpiration in leaves and shoots of cherry laurel and ivy. The results of the studies are tabulated.

It appears that a remarkable degree of variability was observed between transpiration in light and darkness. On certain dates there was no difference, while at other times the transpiration in light was double that taking place in darkness. The average rate of transpiration in light and darkness in the ivy was 136 to 100 and in the laurel 132 to 100. Discussing the reason for increased transpiration in light, the author says it may be due either to the fact that the chloroplasts are warmed by the absorption of radiant energy, or that light produces an increased permeability of the plasmic membrane to water.

The influence of light and temperature changes on the germination of Chloris ciliata, G. GASSNER (*Jahrb. Hamburg. Wiss. Anst., 29 (1911), Beiheft 3, pp. 1–121, figs. 3*).—This article gives in greater detail substantially the same statement of results as does a contribution already noted (E. S. R., 27, p. 219).

The action of light on chlorophyll, H. WAGER (*Proc. Roy. Soc. [London], Ser. B, 87 (1914), No. B 596, pp. 386–407*).—An account is given in this paper of some of the effects produced by light on chlorophyll.

When chlorophyll is exposed to light at least two substances are formed, one of which is an aldehyde and the other an active chemical agent capable of liberating iodin from potassium iodid. The author claims that, so far as experiments on dead chlorophyll extracts can be taken as an indication, the aldehyde produced is a product of the photodecomposition or photo-oxidation of chlorophyll, and is not a result of the direct photosynthesis of carbon dioxid and water, as claimed by Usher and Priestley (E. S. R., 25, p. 634).

Formaldehyde as an oxidation product of chlorophyll extracts, C. H. WARNER (*Proc. Roy. Soc. [London], Ser. B, 87 (1914), No. B 596, pp. 378–385*).—A study was made of chlorophyll obtained from grass by extraction with alcohol, the extract being exposed to electric light and sunlight in glass jars.

Where the film of chlorophyll was in contact with air containing carbon dioxid and water vapor, the development of formaldehyde is said to be due to

the decomposition of the films under the action of the oxygen of the air. Formaldehyde was not produced when the films were illuminated in a moist atmosphere of nitrogen or of carbon dioxid. The author claims there is no evidence of the photosynthesis of the aldehyde from carbon dioxid by chlorophyll outside of the plant. An extract of carotin was also investigated and the bleaching of the films of carotin extract was found to be associated with the formation of formaldehyde.

The direct assimilation of free atmospheric nitrogen by plants, E. MAMELI and G. POLLACCI (*Ann. Sci. Agron., 4. scr., 3 (1914), No. 3, pp. 123–142*).—The various theories regarding the assimilation of free atmospheric nitrogen are reviewed, particular attention being paid to that of Jamieson regarding absorption through special trichomes (E. S. R., 19, p. 127). The authors criticise the methods by which Jamieson conducted his experiments and find nothing to substantiate his claim.

In the second part of the paper accounts are given of experiments with a large number of plants, ranging from fungi to phanerogams, grown under controlled conditions in the absence of combined nitrogen. As a result of their investigations the authors conclude that the capacity to absorb free atmospheric nitrogen is one possessed by many or all plants, although some, through their long dependence on combined nitrogen, may have lost this power. They are unable to say definitely in what manner or by what special organs the nitrogen is absorbed, but are disposed to think that it is a physiological function of plants that may be in some way connected with the chemical reactions taking place within the cell.

The influence of organic substances on nitrification and denitrification in cultivated soils, C. BARTHEL (*Ztschr. Gärungsphysiol., 4 (1914), No. 1, pp. 11–48, fig. 1*).—Referring to the claim of Winogradski and Omelianski (E. S. R., 11, p. 424) that the presence of small proportions of organic substances checked the activity of nitrifying bacteria, and of others said to have obtained results with soils opposed to those given by solutions, the author holds, as the result of his own studies, that the influence of organic substances upon nitrification, if not present in too large proportions, is usually rather favorable than otherwise, because of their ready solubility.

Assimilation of inorganic nitrogen compounds by plants, O. BAUDISCH (*Naturwissenschaften, 2 (1914), Nos. 9, pp. 199–204; 10, pp. 229–232*).—This is mainly a synthesis and discussion of results presented by several investigators named, as bearing upon the influence of different wave lengths in nutritive processes in plants. The waves of high frequency are thought to be peculiarly influential as chemical factors in high regions, where the thin dry air allows them freer passage and access to plant foliage.

Assimilation of nitrates by mold fungi, II, A. KOSSOWICZ (*Ztschr. Gärungsphysiol., 3 (1913), No. 4, pp. 321–326*).—Reporting further investigations on the fungi formerly studied (E. S. R., 29, p. 29), the author states that all nine species were able to attain fair development when limited to nitrates as a nitrogen source in the medium, some however requiring considerably more time than others. These mold fungi appear to utilize directly the nitrous ion without the formation of ammonia, the presence of the latter, when noted in the medium, being attributed to the activity of the older fungi acting upon nitrogenous organic compounds.

Protein transformations in yeast.—I, Influence of fermentation on protein formation, W. ZALESKI and W. SCHATALOFF (*Biochem. Ztschr., 55 (1913), No. 1–2, pp. 63–71*).—Among the conclusions reached as the result of these experiments the authors state that acetic aldehyde does not greatly influence proteo-

lysis in yeast, also that the conditions attending constructive processes therein exert considerable influence on the later proteolytic changes.

Protein formation in plants.—I, In bulbs of Allium cepa, W. ZALESKI and W. SHATKIN (*Biochem. Ztschr., 55 (1913), No. 1–2, pp. 72–78*).—As part of a more general study on the mechanism of protein formation in different portions of higher plants, the authors report on experiments with sprouting or injured bulbs of *A. cepa*. It is stated that protein formation during sprouting, as also after wounding, is dependent upon a supply of monamino acids.

Relation of some Saccharomycetes to inulin, V. GRAFE and V. VOUK (*Ztschr. Gärungsphysiol., 3 (1913), No. 4, pp. 327–333*).—Discussing detailed results of further studies on inulin metabolism (E. S. R., 30, p. 432), the authors state that as noted in yeasts utilization of inulin appears to be a complicated process, depending not upon the presence of inulin alone but also upon that of certain other components of the nutritive medium, more particularly that of certain hydrolyzed products.

Investigations on the substitution of zinc by other chemical elements, M. JAVILLIER (*Ann. Inst. Pasteur, 27 (1913), No. 12, pp. 1021–1038*).—The author has investigated the possibility of substituting cadmium and glucinium for zinc in culture solutions for the growth of *Aspergillus niger*, and has come to the conclusion that such substitution can not take place. The action of zinc culture solutions for the growth of molds is said to be that of an active catalyzer.

Loss or injury of leaves as related to head and grain formation in rye, O. SCHLUMBERGER (*Arb. K. Biol. Anst. Land u. Forstw., 8 (1913), No. 5, pp. 515–551, figs. 14; abs. in Deut. Landw. Presse, 40 (1913), No. 64, pp. 770, 771*).—This work was carried out with summer rye, various forms and degrees of injury to the leaves being employed.

It was found that injury inflicted at the inception of flowering affects the formation of both head and grain in degrees corresponding somewhat to its severity. The abnormality produced, which is usually less marked about the central portion in case of the head, is both qualitative and quantitative, the latter modification being the greater. This work is regarded as preliminary.

The chemical interpretation of some Mendelian factors for flower color, MURIEL WHELDALE and H. L. BASSETT (*Proc. Roy. Soc. [London], Ser. B, 87 (1914), No. B 595, pp. 300–311*).—According to the authors flower color in *Antirrhinum majus* is due to the presence of at least six factors. In the present paper four of these are considered, particular attention being paid to the yellow pigment. As a result of their studies they conclude that the yellow pigment in Antirrhinum is luteolin.

A discussion is also given of the red and magenta anthocyanin obtained from this flower, and the authors, from their experimental investigation, claim that the reduction and oxidation hypothesis (E. S. R., 30, p. 129) is opposed to the experimental facts. It is believed that the original production of anthocyanins in the plant is either partly or wholly due to the action of an oxidase on a chromogen, most likely a flavone or xanthone.

Inheritance of xenia in beans, J. DANIEL (*Compt. Rend. Acad. Sci. [Paris], 158 (1914), No. 6, pp. 418–420*).—In continuation of a study of xenia in beans, the occurrence of which was previously noted (E. S. R., 28, p. 431), the second and third generations of the hybrids have been grown.

It was found that xenia in these plants varied considerably, the influence of the staminate parent on the color ranging from total to almost nothing. The hybrids between *Phaseolus multiflorus* and the black Belgian bean did not conform to any interpretation of the Mendelian law regarding heredity. The increase from seed that were thought to be identical gave very diverse descendants in different instances and in different years.

Mutation in Penicillium glaucum and Aspergillus niger. H. J. WATERMAN (*Ztschr. Gärungsphysiol., 3 (1913), No. 1, pp. 1–14, fig. 1*).—Concluding a discussion of the causes of mutation and the metabolism of these mutants, the author states that mutation is related in both cases to the same factors limiting development, these including poisons, narcotics, etc., as listed.

A possible mutant in the bellwort (Oakesia sessilifolia) which prevents seed formation, A. F. BLAKESLEE and A. F. SCHULZE (*Science, n. ser., 39 (1914), No. 1008, pp. 621, 622, figs. 2*).—The authors describe a form of the sessile-leaved bellwort in which the pistil is shorter and thicker than in normal flowers and the three stigmas are transformed into functional stamens, each with a pair of pollen sacs. The stigmatic anthers are said to be well formed and filled with perfect pollen, and on account of the transformation it seems that the possibility of fertilization is completely prevented.

A study of semisterility, J. BELLING (*Jour. Heredity, 5 (1914), No. 2, pp. 65–73, figs. 7*).—The results of a study of hybrids of several species of Stizolobium are given, from which the author concludes that accurate knowledge of the degree of sterility of some hybrid plants may be obtained by microscopic examination of the pollen of healthy flowers and sections of the ovules. The explanation of the random abortion of half the pollen grains and half the embryo sacs is apparently due to the segregation of Mendelian factors and not to the action of these factors on the zygotes. Semisterility resulting from crossing is apparently one of the simplest cases of sterility, and a knowledge of its inheritance, it is believed, will help in the investigation of more complicated problems of sterility found in many first-generation hybrids.

Partial barrenness in Lübeck currants, E. ZACHARIAS (*Jahrb. Hamburg. Wiss. Anst., 29 (1911), Beiheft 3, pp. 129–149*).—This work was carried forward, after the author's death in 1911, by W. Himmelbaur, testing the capability, as regards pollination, of several varieties of *Ribes pallidum*. Detailed results are given. It is stated that good results were obtained as regards fertility of the resulting forms by crossing Lübeck with Afsmiter. The normally low fertility of the latter is ascribed to faulty pollen.

Notes on the life history of Ribes pallidum, W. HIMMELBAUR (*Jahrb. Hamburg. Wiss. Anst., 29 (1911), Beiheft 3, pp. 151–245, figs. 69*).—Reporting further studies with *R. pallidum*, carried out in considerable cytological detail at different stages in its early life history in relation to the fertility of this form (considered to be a hybrid of *R. petraum* and *R. rubrum*), which while only 20 to 40 per cent is still higher than that of either parent, the author states that *R. pallidum* is probably identical with Lübeck currant. Individuals of the latter variety are said to show sudden sterility associated with other alterations of habit which are mentioned.

This work concludes with a bibliography.

FIELD CROPS.

Farm crop surveys, E. G. MONTGOMERY (*Jour. Amer. Soc. Agron., 5 (1913), No. 4, pp. 232, 233*).—This paper relates to methods and gives some results of a potato survey in which about 700 records were taken in a county in New York. It is noted that "certain problems came to be outstanding as the inquiry progressed. It now appears that if experimental work has been undertaken previous to the survey we should not have hit on the principal problems in all cases. Also some grower, somewhere, has worked out in practice an answer to many problems, making investigation unnecessary. I am convinced that it would be very profitable, before an extensive line of investigation is undertaken with a crop, to first make a survey of this crop."

New work on methods for variety tests, D. LEHN (*Bl. Zuckerrübenbau, 20 (1913), Nos. 3, pp. 33–39; 4, pp. 52–55*).—This is a discussion of the application of the formula $e = \pm \sqrt{\frac{\Sigma v^2}{n-1}}$ (E. S. R., 30, p. 33), and other formulas in calculating the probable experimental error in variety tests, and similar experiments.

The Hamilton County Experiment Farm.—Second annual report, for the year 1913 (*Ohio Sta. Bul. 272 (1914), pp. 263–276, fig. 1*).—In this bulletin is described the plan of management of this county experiment farm, and some results are given of tests to determine the present state of soil fertility. This involves a rotation of corn, soy beans, wheat, and clover with fertilizer applications that included chemical fertilizers, yard manures, and shed manures. It is noted that "at the computed prices the cost of treatment has in most cases been greater than the value of the increase. This, however, has not been an unexpected outcome, as the first application of fertilizers or manure is largely absorbed by the soil, and it is not until the treatment is repeated that its full effect is manifest."

Results of variety tests with corn, oats, and soy beans as grain crops, and of silage corn are given, and comparisons made with results in other counties of the State. Yields of soy beans, cowpeas, rape, and millet as forage crops are given for Hamilton County.

[Report of] the professor of field husbandry and director of field experiments, C. A. ZAVITZ (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 38 (1912), pp. 112–170*).—In addition to notes on the soil and climatic conditions, the author gives general results of continuous growth for from 18 to 24 years of each of 34 varieties of farm crops that include cereals, root crops, and legumes.

It is noted that the influence of seed selection has been shown in the increased yields by the use of large, plump seed. Especially was this marked in the case of oats.

[Field crop experiments] (*Rpt. Agr. Dept. St. Vincent, 1912–13, pp. 5–10*).—Results of seed selection, hybridization, and cultural experiments with cotton, and cultural experiments with arrowroot, cassava, and sugar cane are given.

Further experiences with the use of so-called stimulants, A. STUTZER (*Deut. Landw. Presse, 41 (1914), No. 1, pp. 1, 2, figs. 2*).—After discussing similar work by English and German investigators the author gives results of his own with sugar beets, previously noted (E. S. R., 30, p. 529). In water cultures with maize 0.5 gm. of lead nitrate per liter of nutrient solution seemed to be the optimum amount to stimulate growth, although 1, 2, and 0.25 gm. per liter were tried.

Effect of kainit and forty per cent potash salt as a top-dressing for fall and spring cereals, A. STUTZER (*Ztschr. Landw. Kammer Schlesien, 18 (1914), No. 7, pp. 278–280*).—The results of seven experiments are here given in which the 40 per cent potash salt seemed to be the more efficient.

Straw as a fertilizer under various conditions, A. BISCHOFF (*Jour. Landw., 62 (1914), No. 1, pp. 1–95, pls. 5*).—In pot experiments conducted at Göttingen chopped straw was turned under shallow and deep at 10 weeks, 4 weeks, and immediately before planting in both sand and clay soils. Mustard and buckwheat were grown.

From his observations the author concludes that on sandy soil the use of straw practically always was followed by a smaller yield of dry matter and of nitrogen, and that the injurious effect of the straw was less in the presence of sodium nitrate. When deeply covered it seemed to have an injurious effect on the yield of nitrogen. The shallow straw application just before seeding was always more injurious than the others, while the deep straw application was

always most injurious when made 10 weeks before planting. With an increased yield of dry matter there was usually a decrease in nitrogen yield.

On clay soils the application of straw did not uniformly decrease the yields. In the presence of alkaline fertilizers and nitrate of soda the straw showed a greater injury to dry matter and nitrogen yields than in the presence of acid fertilizer and nitrate of soda. In the presence of alkaline fertilizers without nitrate of soda the injury was less than with the nitrate, while in the presence of acid fertilizers without nitrate of soda the effect of the straw was similar to that in the presence of alkaline fertilizers with the nitrate. Where there was injury with the deep application of straw it was always greater than with the shallow application. In the presence of nitrate of soda the early (10 weeks) application of straw seemed to produce greater injury to the crops than the late application, while in the absence of nitrate of soda the late application of straw apparently caused the greater injury. With an increase in yield of dry matter, the nitrogen yield decreased.

The data are given in tabular form.

On the details of development of cereals, O. SCHMIDT (*Landw. Jahrb., 45 (1913), No. 2, pp. 267–324, pl. 1*).—This reports results of experiments to discover characteristics that may be used to determine different varieties.

It is noted that with the exercise of great care varietal differences in the root systems or in the leaf and spike arrangements may be detected, especially in the seedling cereal. Great differences were observed in the length of the vegetative period and the lateness or earliness of the shooting of the spike, but these differences could not serve as variety characteristics as they were so much influenced by climate, and in the young plant by size, specific weight of the seed, and morphological characters. From the results of the investigation, therefore, the author concludes that the observed characteristics of any variety may vary.

The normally formed cereal stalk and its significance, H. PLAHN-APPIANI (*Ztschr. Pflanzenzücht., 2 (1914), No. 1, pp. 27–37, figs. 2*).—This article discusses the relations of length, thickness, and weight of internodes.

It is pointed out that these relations are not influenced to any considerable extent by heredity, and should not be considered a factor in selection breeding, since they were more influenced by environmental factors such as stand, weather, and mechanical injury, as by insects, animals, or wind. The correlations of these structure factors of the internodes seemed to have no bearing on the yield.

Experiment to determine the influence of age and light on the germination of grass seeds, H. REILING (*Keimversuche mit Gräsern zur Ermittlung des Einflusses, den Alter und Licht auf den Keimprozess ausüben. Inaug. Diss., Univ. Jena, 1912, pp. 87*).—Experiments are reported with *Holcus lanatus*, *Poa pratensis*, *Alopecurus pratensis*, and *Festuca pratensis*.

It is noted that the smaller seeds of these species are not at an optimum condition for germination immediately after harvest, but approach that condition in about 6 months. Light is a favorable factor to germination, but with increased age of the seeds seems to be less important. Good ventilation and dryness of the seeds during storage favored the germination process. The data are given in tabular form.

Some practical hints in breeding grasses, RAUM (*Ztschr. Pflanzenzücht., 2 (1914), No. 1, pp. 39–50*).—This article discusses methods of stock and seed propagation, transplanting seedlings, prevention of cross fertilization, and harvesting the mature plants.

Alfalfa and sweet clover, G. ROBERTS, E. J. KINNEY, and H. B. HENDRICK (*Kentucky Sta. Bul. 178 (1914), pp. 3–34, figs. 10*).—This bulletin contains in-

structions for the production of alfalfa and sweet clover and gives results of the application of lime to alfalfa. "From these yields it appears that an application of 4 tons of limestone per acre gives larger yields than 2 tons per acre, but that increasing the application to 6 tons per acre does not give a further increase. . . . Sulphate of potash, used with 2 tons of limestone, gave an increase for the first cutting, as compared with the yield of the corresponding plats on which 2 tons of limestone were used without sulphate of potash, but for the second cutting the reverse was true, with the exception of two of the plats. . . .

"Another fact to be noted is that the difference between limed and unlimed plats is not so great for the second as for the first cutting, the unlimed plats all showing an increase for the second cutting, while the limed plats all show a decrease. . . . The unlimed alfalfa contained only 2.06 per cent of nitrogen, whereas the average for the limed alfalfa was 2.6 per cent. . . . The analyses were made on the first cutting, and are calculated on the basis of 12 per cent moisture content in the hay. As the best limed plats yielded 4 times as much hay as the unlimed plats it will be seen that the limed soil produced 5 times as much protein as the unlimed soil."

Some characteristics of barley kernels as variety constants, Opitz (*Fühling's Landw. Ztg., 62 (1913), No. 24, pp. 866–875*).—Conclusions are based upon data collected on several varieties that were grown at numerous centers during the period 1908–1912. It is noted that absolute weight was found to be a type character, that protein content did not seem to be a type character, and that percentage of glume was a type character of 2-row barley.

Spineless cactus unsuited to Arizona, J. J. Thornber (*Cal. Cult., 42 (1914), No. 4, p. 104*).—Notes are given showing the nonhardiness of the spineless cactus under the temperature and moisture conditions of Arizona, and mention is made of a Mexican variety that is much hardier than the Burbank varieties.

A new forage plant, L. Misson (*Criador Paulista, 8 (1913), No. 78, pp. 1694–1700, figs. 8*).—Descriptive and cultural notes are given for *Chloris virgata*, and its value as a forage plant is discussed.

On the application of vegetative propagation in the breeding of forage plants, J. Vasters (*Fühling's Landw. Ztg., 62 (1913), No. 23, pp. 809–821, fig. 1*).—After discussing the different methods of vegetative propagations, the author gives results of experiments in the propagation of red clover by root, stalk, and tip cuttings from which 26 per cent sent out rootlets. The root cuttings were the most propitious.

On hard seed coats and fractured seed coats in the germination of clover seeds, B. Steglich (*Landw. Vers. Sta., 79–80 (1913), pp. 611–622*).—Results are given of a sudy of hard-coated red clover seeds germinating under various conditions, and of the effect on the seedling during germination in seeds that fracture the seed coats during the germinating process.

It is noted that germination in general took place in the field more slowly and less energetically than in an artificial seed bed. The data show that up to the fourteenth month after planting in the field 51 per cent of the hard-coated seeds of a normal sample germinated, and that germination took place more readily in clay and humus soils than in sand soils. When the hard-coated seeds were separated and planted by themselves germination followed to only 30 per cent, due, it is maintained, to the lack of shading that was furnished in the former case by the plants from the normally coated, early germinating seeds.

Filter paper kept saturated at 40, 60, and 80 per cent proved a satisfactory medium for the germination of hard-coated clover seeds for the purpose of observing the fracture of the seed coat caused by much moisture. This, it is claimed, produces an uneven turgidity resulting in a fracture which often

leads to an injury or a complete breaking off of either the cotyledons or radicle. Brick dust, which allowed for too rapid evaporation, was not suitable for this work.

The number of seeds whose seed coat became thus fractured within 10 days ranged from 7 to 9.75 per cent. With an extension of the period of germination the percentage of fractured seeds became less.

It is noted further that seeds taken from the filter paper just as the germ pricked the seed coat and placed in garden soil in pots showed a very much lower percentage of fractured seed coats and consequently fewer crippled plants.

The author notes that herein lie variations and discrepancies in reports of germination tests in general, inasmuch as the seed is left to lie undisturbed in an unfavorable moisture condition. In sowing the seeds in soil it was found that the optimum conditions for germination as found in the artificial seed tests did not exist and that seeds with fractured seed coats or otherwise weakened germs could scarcely survive.

The effect of weather upon the yield of corn, J. W. SMITH (*Mo. Weather Rev., 42 (1914), No. 2, pp. 78–87, figs. 4*).—On the basis of the assumption that there is a critical period in the growth of every crop during which the weather conditions exert a determining influence upon the yield, the author conducted a series of studies, the results of which in regard to the corn crop are here given as follows:

"The controlling weather factor in the great corn-growing districts of the United States is rainfall. The critical period of growth of corn during which favorable weather will cause a large crop and unfavorable weather a short crop is comparatively brief. If the rainfall for calendar months be considered, that for July has a far greater effect upon the corn yield than rainfall for any other month. The rainfall from about the middle of July to the middle of August has a far greater effect upon the corn yield than that for any other period of similar length. The rainfall for the 10 days following the date of blossoming has an almost dominating effect upon the yield of corn, the larger the rainfall the larger the yield.

"If the rainfall is small during the 10 days after blossoming a high temperature has a very unfavorable effect upon the yield. Rainfalls of one-half inch or more have a greater effect upon the development of corn than falls of less amount. It seems possible to give a close estimate of the probable yield of corn by August 10, by careful study of the weather conditions that have prevailed up to that time.

"The importance of shallow cultivation after each rainfall in July and after August 1 for the purpose of forming a dust mulch and thus preventing the loss of water by evaporation can not be overestimated. The science of agricultural meteorology can be advanced, and the results of these investigations be made of more practical value to the farmer, by a detailed study of the critical periods of growth and the weather factors most affecting the yield of other field and garden crops."

The frequency of low temperatures in the Sudan and its effect on the cotton crop, H. E. HURST (*Cairo Sci. Jour., 7 (1913), No. 87, pp. 265–268, pl. 1*).—This article gives tabulated data and discusses the frequency of low temperature in certain districts as a preliminary to research work on the effect on the cotton crop.

The effect of water on the cultivation of cotton, H. T. FERRAR and H. E. HURST (*Survey Dept. Egypt Paper 24 (1912), pp. VIII+53, pls. 1*).—In studying by means of bore holes the relation between the height of the water table or level of the subsoil water and the yield of cotton, it was found that there

was a steady increase in yield as the thickness of the layer of soil above the water table increased and that the rise of the water table at the end of the summer caused a diminution of the crop. It is noted that "from the close connection between the yield of cotton and the height of the water table found in these cases, it seems probable that the latter is one of the most important of the causes which determine the magnitude of the cotton crop." In irrigation experiments "the rise of water in bore holes situated in the experimental plat was usually about seven times the thickness of the layer applied to the land."

The effect of water on the cultivation of cotton, H. E. HURST and HUGHES (*Survey Dept. Egypt Paper 31 (1913), pp. 23, pls. 3, figs. 2*).—In a further study on the effect of water on cotton in Egypt (see above), experiments in irrigation showed that "on land where the level of the subsoil water was low the yield of cotton increased as the amount of water applied to the land increased, though there were signs of a maximum yield having been reached. On the other hand, the maturing of the cotton was delayed by increase of the water applied."

Some defects in Crotalaria seeds used in Deli, J. A. HONING (*Meded. Deli-Proefstat. Medan, 7 (1913), No. 9, pp. 395–418, figs. 2*).—The tests indicated that Crotalaria seeds seldom germinate more than 50 per cent; that mold readily attacks the seed in germination; that hard-coated seeds reach to 43 per cent or even to 70 per cent if the seeds are dried; that there is a correlation between color and hardness of seed coat, light colored seeds being harder than dark colored ones; and that *C. striata* seed consists of a mixture of seeds of varying colors and degrees of hardness.

Green manuring with sanai in Bihar, A. and G. L. C. HOWARD (In *The Improvement of Indigo in Bihar. Calcutta, 1914, pp. 26–28, pl. 1*).—Experiments with sanai (*Crotalaria juncea*) as a green manure for tobacco in the botanical area at Pusa have shown that drainage is essential to success on the highlands. To get the maximum benefit it is noted that the interval between the plowing in of the sanai and the transplanting of the tobacco should be 8 weeks. A longer or shorter time would lead to loss.

Fertilizer experiment with flax, F. WINDIRSCH (*Deut. Landw. Presse, 41 (1914), No. 10, p. 116, fig. 1*).—In these tests a complete fertilizer (500 kg. Thomas slag, 500 kg. kainit, and 100 kg. ammonium sulphate per hectare) gave greater yields than any two forms only, and also gave the greatest length of stem, 105 cm., in comparison with 70, 80, and 90 cm. by the use of a one-sided fertilizer.

Eight-year variety tests of horse beans, A. ZIFFER (*Arb. Deut. Landw. Gesell., No. 249 (1913), pp. 153*).—Results of variety tests conducted in various centers in Germany from 1905–1912 are reported.

New researches with oats, DENAIFFE and SIRODOT (*Jour. Agr. Prat., n. ser., 27 (1914), No. 4, pp. 111–114, figs. 5*).—Historical and descriptive sketches are given of several varieties of oats classed under side oats and hull-less oats or "naked oats."

Origin of cultivated oats, L. TRABUT (*Jour. Heredity, 5 (1914), No. 2, pp. 74–85, figs. 10*).—A study is reported of the following points: Whether a difference in ancestry has a vital bearing on the adaptability of varieties, forms derived from *Avena sterilis* best suited to southern countries, possibilities of hybridization, indications that environment is a factor in causing variation, and the influence of culture and the results of mutations which include *A. sterilis segetalis, A. sterilis maxima, A. sterilis calvescens, A. sterilis pseudovilis, A. sterilis byzantina, A. sterilis parallela, A. sterilis algeriensis, A. sterilis culta, A. sterilis ludoviciana, A. sativa, A. fatua, A. hybrida, A. strigosa, A. barbata, A. brevis,* and *A. abyssinica.*

"At least three wild species of Avena under the influence of culture may acquire characters fitting them for cultivation. These three species preserve the ancestral characters by which they are adapted to different climates. *A. fatua* gives rise to oats adapted to temperate and mountainous regions; *A. sterilis*, to oats adapted to the southern countries, and to saline soils; *A. barbata* to races adapted to dry countries."

Influence of nitrates on the germinative period of oats, F. PLATE (*Atti. R. Accad. Linci, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 22 (1913), II, Nos. 11, pp. 598–607; 12, pp. 728–733*).—This reports the use of neutral electrolytes in several series of experiments to determine their influence on oat seedlings.

In the first series, nitrates of cæsium, rubidium, potassium, sodium, lithium, and ammonium were used, made up into solutions of varying concentrations as follows: N/50, N/100, N/200, N/400, N/800, N/1,600, and N/3,200. The plants grown in the culture solutions were compared by weight with plants grown on moistened filter with no other nourishment than that furnished by the seed. The oats were taken at a certain stage of development, usually attained at the age of 15 days.

Except in the case of rubidium the two highest concentrations of all the cations produced a growth below the normal, and as a rule the development of the plant increased as the strength of the nutrient solution decreased. Other results are expressed as follows: As to weight of entire plant Rb>K>Na>Li>Cs; in root growth Na>K>Rb>Li>Cs; in shoot growth Li>Na>K>Rb>Cs; and in correlative in development Rb>K>Na>L>Cs.

In the second series the nitrates of barium, calcium, strontium, magnesium, zinc, cadmium, and mercury were used in water solutions. The general action of this group upon the development of the oat seedling is expressed as follows: As to weight of entire plant Ca>Sr>Zn>Ba>Mg, Cd, Hg; in root growth Sr>Ca>Zn>Ba>Mg, Cd, Hg; in shoot growth Ca>Ba>Zn>Sr>Mg, Cd, Hg; and in correlative growth Sr>Ca>Zn>Ba>Mg, Cd, Hg.

Experiments with peanuts, A. C. TONNELIER (*Bol. Min. Agr. [Buenos Aires], 15 (1913) No. 5, pp. 586–589*).—The results of seed selections at Córdoba are shown in the following table:

Percentage of different sized pods from selected seed.

Number of kernels per pod in seed.	Kernels per pod in the harvest.			
	4 kernels.	3 kernels.	2kernels.	1 kernel.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
4 large, shelled before planting	6.20	49.70	37.20	6.90
4 small, shelled before planting	6.60	45.35	41.05	7.00
3 large, shelled before planting	7.12	47.40	38.12	7.36
1 large, shelled before planting	11.20	48.20	33.40	7.20
1 small, shelled before planting	10.40	48.60	33.97	7.03
3 whole pods planted	7.00	47.60	38.10	7.30

Potato culture (*Idaho Sta. Bul. 79 (1914), pp. 67, figs. 14*).—This bulletin consists of four papers, and an introduction by W. L. Carlyle.

Potato culture for northern Idaho, F. L. Kennard (pp. 5–16).—This paper gives notes of culture, varieties, and marketing and results of seed selections. Selections from high-yielding hills gave better yields than those from low-yielding hills or from bulk selections, although the seed tubers used were of the same weight and cut to the same size in each case.

Potato culture under irrigation, J. S. Welch (pp. 17–27).—This paper gives general directions for potato culture under irrigation under the soil and climatic

conditions found at Gooding, variety tests, and some results of experiments on time to irrigate. Better success was obtained by commencing the irrigation about the time the tubers began to form, making about four irrigations and applying about 1¾ cu. ft. per acre in deep furrows, than in commencing when the plants are 4 or 5 in. high or when the tubers are the size of an egg.

Dry land potato culture for southern Idaho, L. C. Aicher (pp. 28–39).—This article surveys the dry land potato industry in southern Idaho and gives notes on cultivation and harvest methods.

Diseases and insect pests of the potato, C. E. Temple (pp. 40–67).—This paper describes the fungus and physiological diseases and insect pests of the potato and offers suggestions for treatment for such as may occur in Idaho.

Potatoes, L. GREENE and T. J. MANEY (*Iowa Sta. Circ. 13 (1913), pp. 2*).—This circular describes 5 early and 6 late varieties of potatoes that have been found to compare favorably with Early Ohio and Rural New Yorker in Iowa. Planting, seed treatment, and spraying directions are given.

Report on the progress and recent work in sugar beet culture, M. HOFFMANN (*Bl. Zuckerrübenbau, 20 (1913), No. 1, pp. 1–7*).—This article reviews and summarizes the results of recent work of investigators on nitrogen content of sugar beets, cultural methods, excrescent growths, weight and sugar content of roots, influence of water, quality and quantity of yield, composition of large beets, defoliation, nematodes, influence of light on the seed production, changes of the beet during storage, germination of dried seeds, and Mendelian studies.

Progress and developments in the culture and selection of the sugar beet and sugar-beet seed (*Sucr. Indig. et Colon., 82 (1913), Nos. 23 pp. 534–539; 24, pp. 561–564; 25, pp. 580–584; 26, pp. 605–607; 83 (1914), Nos. 1, pp. 7–11; 2, pp. 32–36; 3, pp. 58–61*).—This reviews and summarizes the recent literature relating to the cultivation, anatomy, physiology, composition, fertilization, seed selection, by-products, tools and machines, uses of sugar, by-products as feed, insect enemies, and diseases of sugar beets.

On the physiology of beet seeds, H. PLAHN-APPIANI (*Bl. Zuckerrübenbau, 21 (1914), No. 1, pp. 1–5*).—This article reports an experiment to test the value of the size factor in beet seeds and in beet seed balls. The following table shows the results obtained from a single plant, both with seed balls allowed to mature naturally and those in which one-half of the plant had been pruned back to allow the seed balls on that side to grow to a larger size.

Germination of beet seeds of different sizes and from different sized seed balls.

Seed balls maturing naturally			Seed balls from pruned portion.		
Weight of 100 balls.	Number of seeds germinated.	Number of balls germinating seeds.	Weight of 100 balls.	Number of seeds germinated.	Number of balls germinating seeds.
Grams.			*Grams.*		
1.685	192	90	3.874	255	[1] 98
1.700	192	90	3.043	220	[1] 97
			4.854	298	[2] 100
			5.170	310	[2] 100
2.385	254	96	2.910	231	[3] 98
2.330	250	96	2.982	248	[3] 100
1.253	167	89	1.475	156	[4] 93
1.270	161	86	1.385	145	[4] 88
0.573	53	40	0.580	52	[5] 45
0.510	54	34	0.553	59	[5] 54

[1] Unsifted. [2] 5.5-mm. sieve. [3] 4-mm. sieve. [4] 3-mm. sieve. [5] 2-mm. sieve.

Influence of certain stimulants on the development of sugar beets. O. MUNERATI, G. MEZZADROLI, and T. V. ZAPPAROLI (*Staz. Sper. Agr. Ital., 46 (1913), No. 7–8, pp. 486–498; abs. in Sucr. Indig. et Colon., 83 (1914), Nos. 10, pp. 231–234; 13, pp. 305–309; 14, pp. 323–327*).—The sulphate, chlorid, dioxid, and carbonate of manganese, sulphate and nitrate of aluminum, sulphate of magnesium, boric acid, borate of soda, and sulphate of uranium were used in various quantities and combinations in growing sugar beets on over 100 small plats.

The data show that the largest yield, at the rate of 611.2 kg. of sugar per hectare (544 lbs. per acre), was obtained on a control plat without any of the above-mentioned chemicals; the lowest yield, 343 kg. per hectare, was obtained from the plat receiving 100 kg. of nitrate of aluminum per hectare. The highest percentage of sugar, 15 per cent, was obtained from the plat receiving 50 kg. of carbonate of manganese per hectare, on which the yield was at the rate of 374 kg. per hectare with a purity coefficient of 83.73 per cent. The lowest percentage of sugar, 12.63 per cent, was from the control plat from which the yield was 611.2 kg. and the purity coefficient 83.16 per cent. The highest purity figure was 85.6 from the sulphate of magnesia plat where the yield was 455 kg. per hectare and the percentage of sugar 14.51, and the lowest purity coefficient was 79.62 per cent from the manganese dioxid plat where the yield was 533 kg. per hectare and the percentage of sugar 12.99.

Excessive foliage in sugar beets. M. A. VIVIEN (*Bul. Assoc. Chim. Sucr. et Distill., 31 (1914), No. 7, pp. 501–505*).—Analyses of juice from beets that developed leaves and crowns in different degrees showed that those beets with a larger proportion of foliage yielded less sugar than those with a low percentage of foliage, 11.5 against 12.75 per cent in one series, and 12.2 against 14.65 per cent in another series.

Analyses of tops and of trimmed beets are given in tabular form.

Dry matter content of stock beets. H. NEUBAUER and G. HILLKOWITZ (*Landw. Ztschr. Rheinprovinz, 13 (1912), No. 1, pp. 32–34; 14 (1913), No. 2, pp. 20, 21; 15 (1914), No. 7, pp. 117, 118*).—Data are given showing percentage of dry matter in numerous varieties of stock beets grown at several centers, in 1911–1913, as related to the weights of individual beets. In 1911 the weight decreased from 2.19 kg. for beets with less than 9 per cent of dry matter to 0.66 kg. for those with over 13 per cent. In 1912 and 1913 the weights were highest, 2.12 and 1.96 kg., respectively, for beets with from 10 to 11 per cent of dry matter, and showed other irregularities.

Dorsiventral structure of the cane stem. C. E. B. BREMEKAMP (*Meded. Proefstat. Java-Suikerindus., 4 (1914), No. 18, pp. 309–313, fig. 1; Arch. Suikerindus. Nederland, Indië, 22 (1914), No. 2, pp. 41–45, fig. 1*).—Notes regarding the manner in which the leaves overlap are given.

Buying cane by test; some suggestions. C. J. BOURBAKIS (*La. Planter, 52 (1914), No. 4, p. 57*).—This article offers suggestions on the advantages of buying sugar cane at the mill on valuation shown by tests of juice. It is pointed out that the advantages to the producer would be a stimulus to improve the sugar content of the cane by fertilization and cultivation rather than merely the weight of foliage.

Green manures for tobacco. D. VIGIANI (*Coltivatore, 59 (1913), No. 34, pp. 502–504*).—Results of green manuring for tobacco in the Arezzo Province, Italy, show the weight of 1,000 cured plants following beans to have been 138.88 kg., following mustard 94.44, following lupines 100, following turnips 98.23, following goat's rue 70.57, and following manure 90.9 kg.

A new method with the tobacco crop. A. ROMÁN (*Bol. Ofic. Sec. Agr. Cuba, 16 (1914), No. 1, pp. 1–4, fig. 1*).—Successful attempts at planting tobacco seed directly in the field to avoid transplanting are noted.

The progressive development of the wheat kernel, R. W. THATCHER (*Jour. Amer. Soc. Agron., 5 (1913), No. 4, pp. 203–213, figs. 2*).—A report of progress, mostly dealing with methods.

The results, presented in tables, show a fairly regular decrease of mineral matter, ether extract, and fiber as the kernels develop. The percentage of protein decreased during the earlier periods of growth and later increased again.

From actual weights in milligrams of material per kernel of Turkey and Blue Stem wheats at successive stages of development it is shown that regardless of variations in the percentage produced by variations in the relative rate of gains of the several constituents, there is a steady gain in the actual amount of each of those materials in the kernel throughout the period of kernel formation. The relative increase was greatest in the quantity of carbohydrate materials.

"It became a matter of interest, then, to determine whether the statement by Brenchley and Hall that the plant 'continually moves into the grain uniform material . . . possessing always the same ratio of nitrogenous to nonnitrogenous materials and ash' is substantiated by our results. We, therefore, calculated the amount of actual gain in material of the average kernel per day. These data are surprising. On this account, we prefer to regard them as a progress report, subject to later confirmation or modification of the conclusions to be drawn from them. It appears to be quite clear that the composition of the kernel when it is first formed, called by Brenchley and Hall the 'mould,' is more highly nitrogenous than the material which is moved into it, at least during the earlier stages of the filtering-in of the endosperm. But the ratio of carbohydrates to protein in the material gained by the kernels in the later periods of endosperm-filling seems to be lower than at earlier periods, just the reverse of our former ideas based upon general conceptions of plant physiological processes and the quantitative work of Deherain and Dupont. . . .

"It appears from the progress of our work thus far, that the real facts with reference to the conflicting opinions mentioned above are probably as follows: Pericarp material, which in the first stages of development constitutes a comparatively large proportion of the kernel, is probably relatively richer in protein than is endosperm material. Hence, any condition which results in increased proportion of endosperm in the kernel is likely to produce low-protein grain."

Influence of external conditions on heredity, C. FRUWIRTH (*Ztschr. Pflanzenzücht., 2 (1914), No. 1, pp. 51–63*).—As a result of 3-year trials with winter and spring varieties of wheat, no direct influence due to planting the varieties out of their respective seasons could be detected as inherited. A slight modification in flavor and ripening time was observed, due, the author believes, to an indirect influence of resulting variations in nourishment.

Comparison of spikes in a mutation variety of wheat, N. PASSERINI (*Bol. Ist. Agr. Scandicci, 2, ser., 7 (1913), No. 4, pp. 303–305, fig. 1*).—Two forms of spikes are noted and described, one bearded and the other smooth.

Production of new varieties [of wheat] by crossing, N. PASSERINI (*Bol. Ist. Agr. Scandicci, 2. ser., 7 (1913), No. 4, pp. 330–348, pls. 4*).—This article gives methods employed and some results in wheat breeding at Scandicci since 1888.

Some new or little-known oil seeds and oils (*Bul. Imp. Inst. [So. Kensington], 11 (1913), No. 4, pp. 559–574*).—The following are some seeds mentioned as coming from the British tropical dependencies and being exploited for their oil content: *Carthamus tinctorius*, which yielded 29.6 per cent of oil; *Amoora rohituka*, 43.5; *Eruca sativa*, 30.8; *Calophyllum inophyllum*, 71.4; *Mesua ferrea*, 49; *Telfairia pedata*, 62.9; *Bassia latifolia*, from 45 to 55 per cent; and *Acrocomia sclerocarpa* (grugru nuts and kernels) from Grenada 56.2 and from Trinidad 57 per cent of oil. Other seeds mentioned as containing oil of com-

mercial value are *Bassia longifolia*, *B. butyracea*, *B. mottleyana*, and *Pentadesma butyracea*.

On the variations in weight of stored seeds, A. MORETTINI (*Staz. Sper. Agr. Ital., 46 (1913), No. 7–8, pp. 499–524, pls. 2*).—The author reports the results of studies on the weight of grain as affected by insects, rats, birds, respiration, oxidation, and hygroscopic moisture.

It is noted that the weight of wheat with less than 10 per cent of moisture at the time it is placed in storage may oscillate from 18 to 25 per cent during the autumn and spring, but that if it contains from 11 to 12.5 per cent of moisture there will be little variation and if it contains over 12.5 per cent of moisture it will decrease in weight toward spring. With beans it is noted that the increase in weight varied as much as 35 per cent. Lupines showed some increase in hygroscopic power, while corn on the ear varied about 10 per cent. The variations, it is observed, fluctuated according to climate and time of storage, but these results applied in the district of Umbria.

Oxalis on tea estates (*Planters' Chron., 9 (1914), No. 1, p. 4*).—This notes the appearance of *Oxalis violacea* as a troublesome weed in some parts of Nilgiri Hills, British India.

A cover crop as a factor in restricting certain weed seeds, ZADE (*Fühling's Landw. Ztg., 62 (1913), No. 22, pp. 777–785*).—This is a discussion of the influence of shading and crowding by oats, barley, wheat, peas, vetch, turnips, and mustard on the germination and growth of weeds, and gives results of experiments in which small plats of rye and wheat were seeded with 500 seeds each of wild mustard and wild oats.

Results in the spring showed that in a thick stand of rye 0.8 per cent of wild oats had germinated, but no mustard. In a thin stand of rye the corresponding percentages were 15 and 17.9, in a thick stand of wheat 6.6 and 10, in a thin stand of wheat 39.8 and 40.6, and on fallow land 48 and 42.8 per cent.

HORTICULTURE.

Colonial plants, H. JUMELLE (*Les Cultures Coloniales. Paris, 2. rev. ed.: Plantes à Fécule et Céréales, vol. 1, 1912, pp. 108, figs. 35; Légumes et Fruits, vol. 2, 1913, pp. 122, figs. 33; Plantes à Sucre, Café, Cacao, Thé, Maté, vol. 3, 1913, pp. 127, figs. 42; Plantes a Condiments et Plantes Médicinales, vol. 4, 1914, pp. 120, figs. 30*).—The earlier two-volume edition of this work (E. S. R., 13, p. 1043), which deals with the culture, preparation, and utilization of tropical and subtropical plants, has been revised and redivided into 8 parts. Of those here noted, part 1 deals with starch plants and cereals, 2 with vegetables and fruits, 3 with sugar plants, coffee, cacao, tea, and maté, and 4 with condimental and medicinal plants.

Names of the field and market garden crops and of the principal fruit and timber trees of the United Provinces of Agra and Oudh (*Dept. Land Rec. and Agr. United Prov. Agra and Oudh, Agr. Scr., Bul. 30 (1913), pp. 95*).—This comprises a list of synonyms of the field and market garden crops and of the principal fruit and timber trees of the United Provinces of Agra and Oudh. The vernacular names have been classified under six different divisions, with regard to the different dialects prevalent in them.

Recent observations on the value of carbon dioxid in organic fertilizers, E. REINAU and R. KLEIN (*Gartenwelt, 18 (1914), No. 16, pp. 214–218*).—The authors review the literature dealing with the assimilation of carbonic acid from organic manures and from the air and present data secured in some tests conducted in a commercial sized greenhouse.

The following plants were grown in two compartments, containing 40 cubic meters of space (1,412.6 cu. ft.) each: Aspidistra, philodendron, nephrolepis,

pteris, and begonia. One compartment was treated with 150 liters (39.6 gals.) of pure carbon dioxid twice a day at 7 a. m. and at 12 m. The other compartment was used as a check. Observations taken at the end of a 4- and a 7-week period showed an increased growth from carbon dioxid assimilation ranging from 24 to 152 per cent. The leaves were a much fresher green and the colorings of the begonia leaves were more intense. From a commercial standpoint the increased production from two kinds of plants paid for the cost of the carbon dioxid.

A test was made relative to the rapidity of assimilation. The amount of carbon dioxid in the greenhouse was reduced from 5.2 per cent to about 2 per cent in 30 minutes time, and to about 0.26 per cent in 80 minutes. The plants were removed from the house and the test repeated, but in this case the carbon dioxid content was reduced only from 2.33 to 1.43 per cent in 55 minutes. Shading the greenhouse appears to have no material effect on the rapidity of assimilation.

The authors are of the opinion that these experiments indicate that the carbon dioxid content of organic manures is of considerable importance as a fertilizer ingredient.

The home vegetable garden, A. KRUHM (*New York and London, 1914, pp. IV+105, pls. 23*).—In part 1 of this popular treatise the author discusses the general principles of gardening. In part two specific directions are given for growing various vegetables, together with suggestions relative to improved varieties.

A radish-cabbage hybrid, F. GRAVATT (*Jour. Heredity, 5 (1914), No. 6, pp. 269–272, figs. 2*).—The author here describes a cross between two genera which shows extraordinary vigor but absolute sterility.

Strain tests of tomatoes, C. E. MYERS (*Pennsylvania Sta. Bul. 129 (1914), pp. 139–150*).—In the present bulletin the author gives a brief summary of a test of a large number of strains of six varieties of tomatoes, conducted from 1908–1911 inclusive. Data secured for the various strains are reported in tabular form and discussed.

The principal fact brought out by these tests is that variations in yield of more than 13 tons per acre of marketable fruit occurred between different strains of the same variety. In some cases considerable variations in earliness of the strains were also observed. The author concludes that these variations may be attributed to hereditary rather than environmental conditions. It is suggested that, whenever practicable, seed should be given a preliminary cultural test a year in advance of the time when it will be needed for general planting.

Garden notes on new trees and shrubs, W. J. BEAN (*Roy. Bot. Gard. Kew, Bul. Misc. Inform., No. 2 (1914), pp. 49–54, pls. 3*).—A descriptive account is given of a number of new trees and shrubs that have been under observation in the Kew Gardens. Among these plants are a gooseberry-black currant hybrid, two horse chestnuts, a Japanese cherry, and several Chinese shrubs.

The improvement of tree fruits, E. B. BABCOCK (*Univ. Cal. Jour. Agr., 1 (1913), No. 5, pp. 11–14; 1 (1914), Nos. 6, pp. 14–19, figs. 2; 7, pp. 17–24, figs. 5; 9, pp. 3–8, figs. 2*).—The author discusses the various applications of selection in plant production and reviews recent investigations in the improvement of different tree fruits by selection and breeding. Special attention is given to the question of improvement through bud selection.

Apple growing in Delaware (*Bul. Bd. Agr. Del., 3 (1913), No. 2, pp. 15*).—A popular bulletin containing the 1910 census statistics of apple production for the United States, information relative to varieties adapted for Delaware, and brief cultural directions.

Origin of the banana. P. B. POPENOE (*Jour. Heredity, 5 (1914), No. 6, pp. 273–280, figs. 2*).—A popular review of the literature of the subject, including reference to vagaries of pollination and irregularities in the behavior of the banana under cultivation.

Relation of bacterial transformations of soil nitrogen to nutrition of citrus plants. K. F. KELLERMAN and R. C. WRIGHT (*U. S. Dept. Agr., Jour. Agr. Research, 2 (1914), No. 2, pp. 101–113, figs. 7*).—The present paper comprises a contribution to the knowledge of decadence in citrus trees, with special reference to citrus malnutrition, chlorosis, or mottle leaf.

An examination of the soluble-salt content of soil samples taken throughout southern California confirmed the results of other investigators in showing a wide variation in the percentage of carbonates, chlorids, nitrates, and sulphates. Diagrams are given showing the relative nitrogen-fixing power, nitrifying power, and salt content of soil samples taken from good and poor areas in a productive orange grove and in unproductive and chlorotic orange groves. These data indicate that when adjacent areas are compared the soils from the vicinity of deteriorating trees are richer in nitrate nitrogen. The quantities of other salts show no constant relationship to good or poor areas. The nitrate content of poor areas was not excessive except during irrigation, at which time the shallow lateral roots are exposed to a solution which is temporarily stronger than during the intermediate periods. Extensive greenhouse experiments with grapefruit and sour-orange seedlings growing in greenhouse soil and in California soil at Washington, D. C., here described, indicate that nitrate nitrogen in excess produces the typical symptoms of malnutrition. These results are corroborated by reports that in some cases applications of fertilizers high in nitrogen to orange groves showing symptoms of malnutrition have accelerated instead of retarded the deterioration.

The experiments indicate that nitrates are more toxic than chlorids, that nitrates and chlorids together intensify the symptoms of injury, and that moderate quantities of lime—less than 10 per cent of calcium carbonate—exert a more or less pronounced protective action. The range of toxic limits for nitrates in the pot experiments is given as between 0.05 and 0.01 per cent as compared with 0.005 to 0.015 per cent in the field, exclusive of crusts.

Although records are available which show at least temporary benefit from the application of nitrate fertilizers to chlorotic orange groves, it would appear that this benefit may be due to the previously excessive depletion of nitrate nitrogen through the denitrifying action of substances such as mature straw turned under to maintain the humus. The authors' greenhouse experiments show that seedling citrus plants were actually forced by the addition of cellulose and of straw into an apparently typical state of malnutrition through nitrogen starvation caused by the unbalancing of the soil flora and the utilization of all of the nitrate by the organisms which decompose straw and cellulose. Green manures, on the other hand, while causing some actual loss of total nitrogen do not materially disturb the ratios of the nitrogenous compounds.

The evidence tends to show that the total nitrogen content of the soil is of less importance than the control of the rate of nitrification. In pot experiments a normal rate of nitrification was secured with a green crop turned under, hence this practice is recommended for maintaining the humus supply of the soil. The experiments indicate that the extensive use of mature straw is to be avoided, though light applications of straw to fields too high in nitrate, probably also with the liberal use of ground limestone, might be advantageous.

A bibliography of cited literature is appended.

Eremocitrus, a new genus of hardy, drought-resistant citrus fruits from Australia. W. T. SWINGLE (*U. S. Dept. Agr., Jour. Agr. Research, 2 (1914),*

No. 2, pp. 85–100, pl. 1, figs. 7).—An examination of the material of the Australian desert kumquat preserved in the herbaria of Europe and America and a study of living plants now growing in the greenhouses of this Department lead the author to conclude that this plant is out of place in the genus Atalantia, being much more closely related to Citrus. The author here proposes the name Eremocitrus for this genus, which, as far as known, includes only one species, *E. glauca*.

This species is described with reference to its distribution, hardiness, drought resistance, uses, and value for breeding purposes. Attention is also called to the general need for taxonomic study of the wild relatives of cultivated plants. A review of the literature cited is given.

The Australian desert kumquat can be readily grafted or budded on all of the commonly cultivated species of Citrus and the various species of Citrus graft easily on this plant. It is also believed that the desert kumquat will hybridize with different species of Citrus. Hence its value for breeding new types of hardy citrus fruits is suggested.

Babylonian dates for California, P. B. POPENOE (*Pomona Col. Jour. Econ. Bot., 3 (1913), No. 2, pp. 459–477*).—This comprises a descriptive list of the varieties of dates grown in Babylonia. The list is prepared both with reference to the utilization of these varieties in California and also as a guide to future visitors to Babylonia. The author considers this region as the most promising from which to draw a large supply of high-grade offshoots for the United States.

Statistics on the production of grapes and olives in 1913 (*Estadistica de las Producciones Viticola y Olivarera en el Año 1913. Madrid: Govt., 1914, pp. 8*).—This is the usual statistical review relative to the production of grapes, wine, olives, and olive oil in the various regions and Provinces of Spain (E. S. R., 29, p. 439).

Study of the influence of various grape stocks on the quality and quantity of the harvest, H. FAES and F. PORCHET (*Étude de l'Influence de Divers Porte-Greffes sur la Qualité et Quantité de Récolte. Lausanne, 1914, pp. 46, figs. 29*).—An account of this work has been noted from another source (E. S. R., 30, p. 43).

The direct bearers, G. VERGE (*Prog. Agr. et Vit., (Ed. l'Est-Centre), 34 (1913), No. 50, pp. 757–759; 35 (1914), Nos. 1, pp. 15–27, figs. 2; 2, pp. 48–53; 3, pp. 84–89; 5, pp. 153–156; 6, pp. 175–180, fig. 1; 7, pp. 215–218, fig. 1; 8, pp. 247–251; 9, pp. 268–275, figs. 2; 10, pp. 307–309; 11, pp. 340–347, figs. 2; 12, pp. 359–365, fig. 1; 13, pp. 408–412, fig. 1; 14, pp. 440–443; 15, pp. 468–474; fig. 1; 17, pp. 520–527, figs. 2; 18, pp. 563–567*).—The author here summarizes observations made during the past 15 years on direct-producing hybrid grapes growing in the Montpellier experimental vineyard.

Summing up his observations as a whole, the author concludes that there is a considerable choice of direct-bearing hybrid grapes to meet for the most part conditions of climate, production, etc., but in order to secure longevity all of these hybrids should be grafted.

Forcing strawberries with ether and with warm water, G. BULTEL (*Jardin, 28 (1914), No. 652, pp. 120, 121, fig. 1*).—In continuation of previous investigations (E. S. R., 27, p. 145) the author made in 1912 a comparative test of ether vapor and the warm water bath (E. S. R., 23, p. 40) for forcing strawberries. Both processes were satisfactory in producing early fruit. The test was repeated in 1913 with similar results; hence both processes are recommended for the production of early strawberries.

Some of the more important varieties of almonds grown at Andria, L. VIVARELLI (*Coltivatore, 60 (1914), No. 14, pp. 431–434, figs. 3*).—A brief descrip-

tive account of a number of varieties of almonds grown in the vicinity of Andria, Italy.

All about coconuts. R. BELFORT and A. J. HOYER (*London, 1914, pp. XII+201, pls. 26*).—A treatise on coconut culture in which consideration is given to the selection of a plantation site, nursery and plantation practices, the control of coconut diseases and pests, the coir fibre industry, the preparation of copra, the coconut oil, desiccated coconut, and nut butter industries, marketing coconuts and copra, the cost of a coconut estate, the activities of various countries in relation to the coconut industry, and coconuts as an investment.

Native and exotic plants of Dade County, Florida. C. T. SIMPSON (*Washington, D. C. [1913], pp. 46, figs. 12; Proc. Fla. State Hort. Soc., 25 (1912), pp. 166–207*).—In this paper the author gives a descriptive account of the more prominent ornamental trees, shrubs, and plants, both native and exotic, that seem to be especially adapted to the soil and conditions of Dade County, Florida.

History of gardening. MARIE L. GOTHEIN (*Geschichte der Gartenkunst. Jena, 1914, vols. 1, pp. VII+446, pls. 2, figs. 309; 2, pp. 506, pl. 1, figs. 325*).—This two-volume work comprises a history of gardening and garden design.

In volume 1 consideration is given to the gardens of Egypt, western Asia, Greece, the Roman Empire, Byzantium, and Mohammedan countries, and of the middle-age Occident, Italy, Spain, and Portugal during the Renaissance. Volume 2 deals with the gardens of France, England, Germany, and Holland during the Renaissance, gardens during the reign of Louis XIV, the spreading of French gardens in Europe, the gardens of China and Japan, the English landscape garden, and the trend of garden design in the nineteenth century up to the present time. The text is fully illustrated and bibliographies of cited literature are appended.

The horticultural record. R. CORY (*London, 1914, pp. XV+500, pls. 164*).—This volume consists of colored and half-tone reproductions of the most interesting and valuable flowers, plants, shrubs, groups, and rock gardens exhibited at the Royal International Horticultural Exhibition in 1912, accompanied by contributions on the progress of horticulture since the first great International Horticultural Exhibition of 1866. These contributions deal with rock gardens and garden design, the rose, trees and shrubs, sweet peas, tropical garden plants, orchids, greenhouse plants, carnations and pinks, British and foreign ferns, fruit, and vegetables.

Information is also given relative to the arrangements, rules and regulations, awards, etc., for the 1912 exhibition, together with reports on horticultural education and legislation in connection with plant diseases.

International Congress of Horticulture at Ghent (*Cong. Internat. Hort. Gand, Raps. Prélim., 1 (1913), pp. 15+273, figs. 2*).—This comprises abstracts and papers by various reporters dealing with different phases of the following subjects: Floriculture, market gardening, horticultural investigations and education, commerce, transportation, tariffs, and landscape gardening.

FORESTRY.

The Bradley bibliography.—IV, Forestry. A. REHDER (*Cambridge, Mass., 1914, vol. 4, pp. XIII+589*).—The present volume of the Bradley Bibliography (E. S. R., 27, p. 846) aims to contain the titles of all publications relating to forestry and silviculture, including the more important articles published in periodicals and other serials. Volume 3 of this work has not thus far appeared.

Report of the forest branch of the Department of Lands for the year ending December 31, 1913. H. R. MACMILLAN (*Brit. Columbia Rpt. Forest*

Branch Dept. Lands, 1913, pp. 61, pls. 17, figs. 4).—This comprises the report of the chief forester of the Department of Lands of British Columbia for the year ended December 31, 1913. The report deals with the organization of the forest service, forest revenues, importance of the lumber industry, logging inspection, scaling, timber sales, railway permits, products, forest insect damage, exports, land examination, forest reconnaissance, forest reserves, grazing, forest protection, and improvements.

A preliminary forest map of British Columbia is given.

Annual progress report of forest administration in the Western, Eastern, and Kumaun Circles of the United Provinces for the forest year 1912–13, H. B. BILLSON, P. H. CLUTTERBUCK, and F. F. R. CHANNER (*Ann. Rpt. Forest Admin. West., East., and Kumaun Circles [India], 1912–13, pp. 21+19+13+LX+5*).—This is the customary review relative to the administration and management of the state forests in the Western, Eastern, and Kumaun Circles of the United Provinces, including financial statements for the forest year 1912–13. All the important data relative to alterations in forest areas, surveys, working plans, forest protection, silvicultural operations, revenues, expenditures, etc., are appended in tabular form.

Annual progress report of the forest administration in Ajmer-Merwara for the year 1911–12, HUKAM CHAND (*Ann. Rpt. Forest Admin. Ajmer-Merwara, 1911–12, pp. 3+26*).—A report similar to the above relative to the administration and management of the state forests of Ajmer-Merwara for 1911–12.

Progress report on forest administration in the Province of Assam for the year 1912–13, R. M. WILLIAMSON and W. F. PERREE (*Rpt. Forest Admin. Assam, 1912–13, pp. 2+34+53+3, pl. 1*).—A report similar to the above relative to the administration and management of the state forests in the Eastern and Western Circles of Assam for the year 1912–13.

Progress report of forest administration in Coorg for 1912–13, H. TIREMAN (*Rpt. Forest Admin. Coorg, 1912–13, pp. 3+11+13*).—A report similar to the above relative to the administration of the state forests in Coorg for the year 1912–13.

Conservation of the forest (*Rpt. Conserv. Com. La., Sept., 1912–Apr., 1914, pp. 33–45, figs. 3*).—A brief summary of forest conditions in Louisiana, including recommendations for their conservation, based upon a survey made by the Forest Service of the U. S. Department of Agriculture (E. S. R., 28, p. 146).

The text is also given of a timber conservation contract entered into between a large lumber company and the Conservation Commission of Louisiana.

On afforestation and the planting of fruit trees in the dry lands of Chile, S. IZQUIERDO (*Jour. Roy. Hort. Soc. [London], 39 (1914), No. 3, pp. 581–589, pls. 4*).—A brief account of methods of planting forest and fruit trees in the dry lands of Chile.

Forest fires, W. G. HOWARD (*N. Y. Conserv. Com. Bul. 10 (1914), pp. 52, pls. 8, figs. 2*).—In this bulletin the author reviews the most serious forest fires in the past; discusses the nature and causes of forest fires, protective and preventive measures, fire fighting, and progress in legislation; and describes the present fire protective system maintained by the state conservation department, including cooperative assistance under the Weeks law (E. S. R., 24, p. 498).

Some Irish larch plantations, J. H. WADDINGHAM (*Jour. Bd. Agr. [London], 21 (1914), No. 2, pp. 116–123, pls. 2*).—The statistics here presented were collected with the object of determining the volume of timber produced by larch at different ages and the effect of density on the volume. Sample plats of

woods of different ages and density were carefully laid out and accurately measured.

Increase in the flow of latex from Manihot glaziovii as a result of peeling off and scraping the outer layers of the bark, A. ZIMMERMANN (*Pflanzer, 10 (1914), No. 4, pp. 180–188*).—Data are given on tapping experiments conducted by Fickenedy at the Kamerun experiment station and by the author and Lommel at the Amani station in German East Africa.

The results of these experiments led to the conclusion that the flow of latex can be increased by either peeling or scraping the outer bark. Scraping the bark gives a much greater yield than that secured by peeling the bark off entirely. It is also less costly in practice and is less apt to injure the trees. The employment of this method, especially on old and much tapped trees, appears to be advisable.

Report on an inspection tour of the rubber industry in Ceylon, the Straits Settlements, and Deli, P. ARENS (*Meded. Proefstat. Malang, No. 8 (1914), pp. 83, pls. 7*).—This embraces the results of a survey of the rubber industry in Ceylon, the Straits Settlements, and Deli, which was conducted with the view of securing information of value for the development of the industry in Java. The information secured deals with various planting operations, cultural practices, tapping operations, preparation, grading, and packing of crude rubber, etc.

Creosoted piling in Galveston Bay bridge, F. B. RIDGWAY (*Engin. News, 71 (1914), No. 22, pp. 1176–1182, figs. 12*).—Data secured from an examination of bridge piling, the first lot of which was set in 1875 and removed in 1913, are here reported.

The results of the examination of these piles show that the 38-year-old piles which received a very light treatment of creosote are mostly destroyed. Over 90 per cent of about 3,000 18-year-old piles which were given a heavy treatment of creosote are still in good condition.

A fence post test progress report, F. G. KRAUSS (*Hawaii. Forester and Agr., 11 (1914), No. 4, pp. 87, 88*).—The results for the third season's test of eucalyptus fence posts (E. S. R., 29, p. 443) show the creosoted posts to be in the best state of preservation, the tarred posts being the second best preserved. The posts set in concrete are showing rapid disintegration.

DISEASES OF PLANTS.

The diseases of tropical plants, M. T. COOK (*London, 1913, pp. XI+317, pl. 1, figs. 85*).—This book, by the plant pathologist of the New Jersey College Station, is primarily intended for the planter, but it will doubtless prove of service to the student of tropical economic botany as well, as the author has brought together a large amount of data scattered through many publications.

After introductory chapters on the nature and symptoms of plant diseases, the classification of fungi, and a description of other causes of plant diseases, the diseases of many of the tropical economic plants are described at considerable length, the arrangement being according to the host plants. The subjects of prevention and control and fungicides and spraying apparatus are treated in separate chapters, although under many of the descriptions of diseases specific recommendations are given for combating them.

The author recognizes the limitations under which this work was prepared, and he invites correspondence and suggestions from plant pathologists of the tropical world.

Outline of administration in controlling insects and fungi injurious to agricultural plants in Japan (*Tokyo: Bur. Agr., Dept. Agr. and Com., 1913,*

pp. 32, fig. 1).—This pamphlet deals with methods of administration in controlling diseases and insect pests of agricultural plants, entomological and pathological arrangements at agricultural experiment stations, measures for controlling diseases and insect pests of agricultural plants adopted by public communities, and education and practice upon insect pests and plant diseases.

Report of the mycological section, C. J. J. VAN HALL (*Jaarb. Dept. Landb., Nijv. en Handel Nederland. Indië, 1911, pp. 37–39*).—The author briefly reports on some of the investigations in progress in the mycological laboratory, the principal studies being on the canker of cacao, downy mildew of maize, root rot of Hevea (probably due to *Fomes semitostus*), and the rot of cacao caused by *Phytophthora faberi*.

From diseased cacao trees three forms of Fusarium have been isolated, and studies are reported in progress with these organisms to determine their relations with the canker disease. The Peronospora disease of maize is said to be due to *P. maydis*.

The genus Atichia, A. D. COTTON (*Roy. Bot. Gard. Kew, Bul. Misc. Inform., No. 2 (1914), pp. 54–63, fig. 1*).—The author describes *A. dominicana* n. sp., an aberrant species of Ascomycetes found on lime leaves in the West Indies. The genus to which this fungus belongs was formerly grouped with the Collemaceæ, but it is now placed in the family Atichiaceæ. A conspectus of the eight known species of the family is given.

Studies on Nectriaceæ, I, J. WEESE (*Ztschr. Garüngsphysiol., 1 (1912), No. 2, pp. 126–155, figs. 4*).—Claiming that the fungus described as *Nectria rubi* n. sp., by Osterwalder (E. S. R., 26, p. 450), is not a new species, but a variety of *N. mammoidea*, and discussing further *N. galligena* on fruit and other trees (E. S. R., 26, p. 448), the author describes as new species several fungi which are named, respectively, *N. pseudograminicola* (on leaves of *Calamagrostis arundinacea*), *N. flammeola* (on *Populus canadensis*), *N. incrustans* (on Betula and Alnus), also as new varieties *N. inundata minor* and *N. cinnabarina vencta*. The systematic position of *N. platyspora* is also critically discussed.

Remarks concerning Weese's studies on Nectriaceæ, A. OSTERWALDER (*Ztschr. Gärungsphysiol., 3 (1913), No. 2, pp. 212, 213*).—A brief discussion is given of the article noted above.

A reply to Osterwalder's remarks concerning studies on Nectriaceæ, J. WEESE (*Ztschr. Gärungsphysiol., 3 (1913), No. 2, pp. 214–223*).—This is a further discussion of the author's previous publication (see above).

A review of the genus Phytophthora, G. W. WILSON (*Mycologia, 6 (1914), No. 2, pp. 54–83, pl. 1*).—This is mainly a historical review, with bibliography, of work recently published on the genus Phytophthora, containing descriptions and discussion of 13 species as established and of 3 considered as yet of doubtful classification.

Corrosive sublimate and sublimoform for rust and Fusarium on grains (*Prakt. Bl. Pflanzenbau u. Schutz, n. ser., 12 (1914), No. 2, pp. 16–19*).—Results of treating seed grain with sublimoform or with corrosive sublimate were not quite uniform with those of the previous year. The use of these two fungicides jointly is suggested.

Causes of mycelium formation in Ustilago jensenii, E. HILS (*Ursachen der Mycelbildung bei Ustilago jensenii. Diss., Tübingen, 1912, pp. 42, figs. 10; rev. in Mycol. Centbl., 3 (1914), No. 7, pp. 338, 339*).—Summarizing conclusions drawn from this study, the author claims it to be highly probable that the formation of mycelium in barley by *U. jensenii* is favored by an excess of oxygen in the interior of the host plant as well as by the presence of alkaline products of metabolic changes in the fungus itself.

"Grey leaf" or "dry leaf" on oats (*Edinb. and East of Scot. Col. Agr. Rpt. 30 (1913), pp. 22, 23; abs. in Jour. Bd. Agr. [London], 20 (1914), No. 11, p. 1010*).—This disease, noted recently as attacking certain varieties of oats named, is said to cause early decoloration, without yellowing, however, of the leaves along the margins and near the bases, these effects spreading upward with the growth of the plant. The upper leaves may show a healthy color or else red stripes. Heads are absent, or late and small, grains being few or poorly developed. Some varieties, as Polish White, show only slight attack. While the disease is regarded as due to some condition not yet fully understood, it is thought to be favored by fertilizers which produce an alkaline soil, as sodium nitrate and basic slag, and to be lessened by such fertilizers as ammonium sulphate and superphosphate. Manganese sulphate is also credited with a beneficial influence.

Leaf cut, or tomosis, a disorder of cotton seedlings (*Agr. News [Barbados], 13 (1914), No. 312, pp. 126, 127*).—The occurrence in St. Croix is reported of a serious infection of cotton closely resembling that which has been previously described by Cook as occurring in the United States (E. S. R., 29, p. 47).

Tikka disease and the introduction of exotic groundnuts in the Bombay Presidency, E. J. BUTLER (*Agr. Jour. India, 9 (1914), No. 1, pp. 59–70, figs. 4*).—Reviewing briefly circumstances connected with the decline in yield of the peanut ascribed to *Sceptoglœum arachidis* in the period from 1895 to 1902 in parts of India and the progress toward recovery since 1903, the author discusses the apparent influence of the introduction of foreign and the possible development of resistant native varieties, suggesting, however, that probably not all the factors involved have as yet received full recognition.

Potato scab and potato canker, G. KÖCK (*Ztschr. Landw. Versuchsw. Österr., 16 (1913), No. 10, pp. 1005–1008, figs. 2*).—Noting from specimens sent to the station as supposed cases of potato canker, the existence of an apparent confusion of this disease due to *Chrysophlyctis endobiotica* with scab ascribed to *Oospora scabies*, *Spongospora solani*, etc., the author gives illustrated descriptions of each disease in typical form.

Powdery scab of potatoes, W. J. MORSE (*Maine Sta. Bul. 227 (1914), pp. 89–104, pls. 4*).—An account is given of the history and distribution of the powdery scab of potatoes due to *Spongospora subterranea*, the ocurrence of which in the United States has been previously noted (E. S. R., 29, p. 448). While the fungus has not been present in this country long enough to secure exact data regarding its behavior, the author describes its principal characteristics, and some diseases for which it may be mistaken, discusses its economic importance, and gives suggestions relative to means to be employed for the prevention of its spread, the information being largely drawn from the work of Pethybridge (E. S. R., 29, pp. 448, 549) and Güssow (E. S. R., 29, p. 448).

[Orders regarding plant diseases] (*Jour. Bd. Agr. [London], 20 (1914), No. 11, pp. 1020–1024*).—This article covers substantially the same ground as that previously noted on wart disease of potatoes (E. S. R., 31, p. 149).

Yellowing of sugar beets, A. MALAQUIN and A. MOITIÉ (*Engrais, 29 (1914), No. 9, pp. 241–243*).—Giving a brief discussion of the history, characters, and effects of beet yellowing, the authors state that the disease may be spread by the mother beets, by seed, and by débris left in the soil. To recommendations as given by Delacroix (E. S. R., 16, p. 479) in connection with his description of the alleged cause, *Bacillus tabificans*, are added their own suggestions, namely, drying the seed at from 40 to 55° C. to a water content of from 5 to 7 per cent, also rigorous selection of roots to be used for production of seed.

The past history and present position of the bitter pit question, D. McAlpine (*Prog. Rpt. Bitter Pit Invest. [Australia], 1 (1911–12), pp. 197, pls. 34; abs. in Bot. Centbl., 122 (1913), No. 18, p. 431*).—This is the full report (E. S. R., 29, p. 246) of these investigations to date.

It is stated that the delicate skeleton of vessels which remains, preserving a model of the fruit after the softening and removal of the flesh, normally functions in the distribution and regulation of the food supply to the periphery of the fruit, where the most rapid growth takes place. Bitter pit is said to be an internal disease found in association with discoloration of the vascular bundles and probably not due to an organism. The brown spots are generally first found in the subcutaneous zone occupied by the vascular network. Bitter pit may be noted when the fruit is about the size of a walnut, but most generally after it is half grown, and it most commonly occurs in the upper half, where the openings in the skin are more numerous and water is less abundant owing to evaporation.

This injury appears to stand in relation with intermittent weather conditions at a critical period of growth; the amount and rapidity of transpiration and sudden checking thereof at night while the roots are still active owing to heat in the soil; a failure of supplies at the periphery of the fruit, followed by spasmodic and irregular recovery; an inequality of growth resulting in irregular formation of the vascular network controlling the distribution of nutritive material; fluctuations of temperature in stored fruit; and the specific nature of the variety in question. The relation of each of these factors to the development of bitter pit is under investigation.

It is stated that pitting may be noted in case of fruit on young, rapidly growing trees, as also in the case of light crops with abnormally large fruit. The quince is less liable to pitting than is either the apple or pear. In stored fruit the safest temperature is that at which respiration is practically suspended, that is, 30 to 32° F. The delicate structure of the apple and its supply of vessels show the necessity of careful handling and skilled packing for transportation.

An extensive bibliography is appended.

The diseases of the banana, J. E. van der Laat (*Las Enfermedades del Banano. San Jose, Costa Rica: Dept. Agr., 1914, pp. 19, figs. 3*).—Some diseases of bananas in Costa Rica are described, particular attention being given to that known as the Panama disease.

Two species of Fusarium are said to attack bananas, one of which is the cause of the so-called Panama disease. The difference in susceptibility of varieties of bananas to this disease is pointed out and the author suggests more rational methods of cultivation as factors in its control. The disease is said to be favored by an unbalanced condition of the nitrogen in the soil, a lack of soluble potash, and the accumulation of excretions from the banana plant.

Report on some of the diseases of citrus fruits, C. Ross (*Queensland Agr. Jour., n. ser., 1 (1914), No. 1, pp. 48–54; noted in No. 2, p. 107*).—Reporting on a tour of investigation on diseases and pests affecting citrus fruits, the author states that collar rot (*Fusarium limonis*), was found in two places. The common rough lemon, now abundant in a wild state and practically immune to this disease, is recommended for use as a stock. In addition to thorough cultivation, judicious manuring, good drainage, and close planting as preventive measures, cutting and burning affected parts, aseptic treatment, etc., are insisted upon.

Root rot (*Phoma omnivora*) is reported at one locality and is distinguished from somewhat similar fungi. Lemon bark blotch (*Ascochyta corticola*) was observed in one instance. Scabbing of fruit and leaves was abundant and highly injurious in some places named. Anthracnose (*P. citricarpa*) was

not very prevalent and was not here associated with melanose, which was elsewhere noted in one instance. The latter disease was sometimes associated with Maori on fruit, weak lime-sulphur wash being recommended in such cases. Some other troubles of fungus or insect origin are discussed, and numerous fungicidal formulas or other treatments are given.

The pathological significance of the endocellular fibers in the tissues of grapevines, L. PETRI (*Atti R. Acad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 22 (1913), II, No. 4, pp. 174–179, fig. 1*).—Referring to the contribution of Mameli (E. S. R., 29, p. 551), the author states that the formation of endocellular fibers always precedes by one or more years the external manifestations characteristic of roncet, but that their presence is not always followed by the appearance of this deformation in chronic form. It is considered inadmissible to conclude without adequate experimentation that vines showing these endocellular fibers are really free from incipient roncet.

Reply to L. Petri regarding endocellular fibers and roncet of grapevines, EVA MAMELI (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 22 (1913), II, No. 11, pp. 604–607*).—Discussing the above article, the author states that she has found the endocellular fibers in question in perfectly sound individuals representing numerous species of dicotyledons, including normal grapevines under very diverse conditions of cultivation and climate.

More on the pathological significance of the endocellular fibers in tissues of grapevines, L. PETRI (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 23 (1914), I, No. 3, pp. 154–161, fig. 1*).—This is an argumentative review of the articles above noted and of other contributions cited.

Diseases affecting pecan trees, H. K. MILLER (*Amer. Fruit and Nut Jour., 7 (1913), No. 99, pp. 12–14, figs. 2*).—The author, giving the results of experience with pecan diseases in Florida, states that the blight causing leaf fall of young seedlings can be controlled by spraying with Bordeaux mixture every 10 or 15 days during foliation. Pecan scab (*Fusicladium effusum*), attacking nuts, leaves, and twigs, is said to be worse on pecan stock from Texas, and in wet than in dry seasons, also probably on trees weakened by cutting for grafts and bud wood. The application of lime sulphur to dormant trees and of Bordeaux mixture to trees in foliage is recommended, and sanitary cultivation is insisted upon.

Rosette is considered as due to malnutrition, perhaps in most cases caused by soil acidity or the character of the fertilizer employed. The use of ground limestone or Thomas slag has corrected the conditions and given good results in cases mentioned. Other factors and other remedies are suggested.

Winterkilling is considered as caused by sudden cold in autumn or spring, by cutting away too severely in taking bud wood, or by defoliation in early fall in case of attack by webworms. Orchard practice tending to induce early dormancy in autumn or late foliation in spring is recommended.

Immunization of hollyhock against rust, J. ERIKSSON and C. HAMMARLUND (*Compt. Rend. Acad. Sci. [Paris], 158 (1914), No. 6, pp. 420–423*).—Results of previous work by Eriksson on hollyhock rust (*Puccinia malvaccarum*) (E. S. R., 25, p. 850) having raised the question as to the possibility of weakening more or less the interual mycelium by the use of fungicidal solutions in watering the plants, tests were carried out with copper sulphate of from 1 to 10 per cent strength in 1912 and 1 to 5 per cent in 1913.

From the tabulated results it appears that a strength of even from 1 to 3 per cent is sufficient to limit greatly the development of the fungus, all of the new leaves in many cases proving to be free from rust. It is therefore claimed that this parasite may be greatly checked or controlled by the application of a fungicide through the roots.

Observations on the life history of Ustilago vaillantii, IVY MASSEE (*Jour. Econ. Biol., 9 (1914), No. 1, pp. 9–14, pl. 1*).—The author states that *U. vaillantii*, found only on Liliaceæ, permanently infests its host in the seedling stage. The fungus grows up from the bulb each year with the stem and produces in the anthers and ovary spores which, after being dried, retain vitality for at least three months.

Phytopathological notes from North American forests, C. VON TUBEUF (*Naturw. Ztschr. Forst u. Landw., 12 (1914), No. 2, pp. 89–91, fig. 1*).—Reporting briefly a study of two species of Uredineæ noted on a recent American tour, the author names these *Cœoma pseudotsugæ douglasii* and *Uredo chamæcyparidis nutkænsis*, respectively.

The morphology and life history of the chestnut blight fungus, P. J. ANDERSON (*Penn. Chestnut Tree Blight Com. Bul. 7 (1913), pp. 44, pls. 17*).—The results are given of a study on the morphology and life history of the chestnut-blight fungus (*Endothia parasitica*).

Among the observations reported it is stated that the ascospores germinate readily in water, while the pycnospores require a nutrient medium. The pycnospores germinate on the twigs of a large number of forest trees and also in humus about the base of the trees. At summer temperatures the pycnospores germinate in from 12 to 36 hours, while the ascospores germinate in from 2 to 12 hours. Lower temperatures retard germination. The ascospores in the perithecia and the pycnospores in the "horns" are said to retain their germinative power for at least a year. The longevity of the spores is diminished when they are separated from each other or exposed to the air. Winter weather conditions were found not to affect the vitality of either kind of spores or of the mycelium. The author states that the mycelium does not invade the living tissues as individual hyphæ, but in flat fan-shaped mats. It continues to grow in the bark even during the winter months, but with much more rapidity in the summer season. The fungus, it is said, may be carried over in the bark for a year or more by the mycelium even when the bark is kept quite dry.

A bibliography is given.

The death of chestnuts and oaks due to Armillaria mellea, W. H. LONG (*U. S. Dept. Agr. Bul. 89 (1914), pp. 9, pls. 2*).—The results are given of a study of chestnut and oak trees in New York and in North Carolina, from which the author claims that chestnut timber in these two regions is deteriorating, as shown by the small annual increment during recent years, by the thin sapwood, by the large percentage of diseased and stag-headed tops, as well as by the number of dead and dying trees. The decline is considered probably due to several factors, one of which is the root rotting fungus *A. mellea*. This fungus, it is claimed, can become an active parasite under favorable conditions, especially on oaks and chestnuts, killing not only suppressed trees in the forest, but those growing under more favorable conditions. The prevalence and apparent destructiveness of this fungus seem to point to it as a very important factor in the gradual recession of the chestnut timber in North Carolina.

The chestnut bark fungus (*Endothia parasitica*) was not found present in either of these localities.

A preliminary contribution on the receptivity of oak for Oïdium, V. RIVERA (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 22 (1913), II, No. 4, pp. 168–173*).—Reporting a study of Oïdium on *Quercus robur* in relation to attack from Oïdium as affected by temperature, age, turgidity, and functional activity of the leaves, and rapidity of root absorption, the author concludes that while mature leaves are resistant to this disease, rapidity of growth favors attack. Young leaves kept in a very humid atmosphere in a constant state of high turgidity are not very susceptible to attack. High temper-

ature appears to influence susceptibility of leaves to attack through its effect on turgidity. Both pure water and very concentrated nutritive media are unfavorable to attack on the leaves, as also is complete etiolation thereof, partial etiolation showing diverse results in this respect. Mineral nutritive materials do not appear to influence attack directly.

The yellow spot disease of cork oak, A. MAIGE (*Bul. Sta. Forcst. Nord Afrique, 1 (1912), No. 1, pp. 10–27*).—A description is given of a disease of the cork oak which is characterized by the occurrence of yellow spots on the bark. The trouble seems to be due to the presence of micro-organisms, which are unable to attack the sound bark but develop following the presence of other fungi, particularly some of the molds such as Aspergillus.

Various methods are suggested for the control of this trouble, which is said to be rather serious in some portions of nothern Africa.

An enemy of the western red cedar, W. A. MURRILL (*Mycologia, 6 (1914), No. 2, pp. 93, 94, fig. 1*).—Giving a description of a fungus recently noted, claimed to be new and named *Fomitiporia weirii*, the author states that the species is abundant throughout northern Idaho and Washington, being the principal fungus found in connection with decay of red cedar. It is said to continue its destructive ravages in the heartwood and sapwood after the tree has fallen, and it may even attack the bark. Separation of the annual layers in initial stages is followed by a characteristic and easily recognizable brown friable rot. Special investigation of this disease is contemplated for the field season of 1914.

Cone bearing and cauliflory in witches' broom, P. JACCARD (*Naturw. Ztschr. Forst u. Landw., 12 (1914), No. 3, pp. 122–128, fig. 1*).—The author describes a very large witches' broom on a larch tree showing male flowers on the stems, and numerous cones, apparently normal, along with other peculiarities of an anatomical or chemical nature. The witches' broom noted showed a healthy green, contrasting strongly with surrounding foliage which was discolored, following a general attack by *Tortrix* (*Steganoptycha*) *pinicolana*.

A preliminary note on a new bark disease of the white pine, A. H. GRAVES (*Mycologia, 6 (1914), No. 2, pp. 84–87, pl. 1*).—Attention is called to a disease spreading in circular areas in white pine groves in several localities in New England.

The bark shows a degree of contraction at or near the surface of the ground, or in bad cases a girdling due to death of the bark. Of several organisms isolated from the diseased areas since the discovery of the trouble in 1911, a very common one, believed to be a Fusarium, is thought to be an important factor. Up to this time inoculations have apparently been unsuccessful, but investigations are in progress and further results are to be published. Pending further study, the removal and destruction of all affected trees or parts are insisted upon.

White pine blister, W. C. O'KANE (*Country Gent., 79 (1914), No. 6, p. 251, figs. 3*).—This is a popular account of this disease as far as known in the United States.

Fairy rings, E. MÜNCH (*Naturw. Ztschr. Forst u. Landw., 12 (1914), No. 3, pp. 133–137, figs. 2*).—The author discusses a fairy ring fungus, supposed to be *Agaricus maximus*, and kept under observation for three years, stating that attempts to extend the organism by transferring sward containing the mycelium have not succeeded in spreading it beyond the original limits of the portions of turf that were transferred.

Two new wood-destroying fungi, J. R. WEIR (*U. S. Dept. Agr., Jour. Agr. Research, 2 (1914), No. 2, pp. 163–167, pls. 2*).—Technical descriptions and economic notes are given on two new species of wood-destroying fungi, *Fomes putearius* and *Trametes setosus*, both of which are found on dead coniferous

wood throughout the white pine timber belt of the northwestern United States and adjacent regions.

Studies in dry rot.—III, IV, C. WEHMER (*Mycol. Centbl., 2 (1913), No. 7, pp. 331–340, figs. 3; 3 (1914), No. 7, pp. 321–332, fig. 1*).—Continuing this series (E. S. R., 27, p. 654), the author reports infection tests with *Merulius lacrymans* under varied conditions on a number of woods more or less commonly used in buildings, furniture, packing cases, etc., giving details as to behavior of each under various conditions of temperature, moisture, etc., continued for several months.

It appears, from the results detailed, that the woods entirely unchanged by the fungus were those of *Tectona grandis, Swietenia mahagoni, Robinia pseudacacia, Juglans nigra,* and *Cedrela odorata;* slightly attacked, *Quercus pedunculata;* severely attacked, *Ulmus campestric, J. regia, Fagus sylvatica, Tilia parvifolia, Betula alba,* and *Picea vulgaris.*

Numerous laboratory infection studies with pure cultures indicated that Merulius apparently does not seriously attack mature fir wood under conditions employed, even when other organisms are present. Studies carried out in the moist atmosphere of a cellar gave almost the same negative result. Further reports are promised.

Soil disinfection with carbon bisulphid, A. ROLET (*Jour. Agr. Prat., n. scr., 27 (1914), No. 3, pp. 89–91*).—This article discusses briefly the manner and amount of dosage with bisulphid of carbon as used for the purpose of controlling various subterranean insect and cryptogamic enemies of cultivated plants.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

A history of British mammals, G. E. H. BARRETT-HAMILTON (*London, [vol. 2], 1912, pts. 11, pp. 217–264, pls. 4, figs. 5; 12, pp. 265–312, pls. 3; 1913, pts. 13, pp. 313–360, pls. 2, figs. 4; 14, pp. 3+361–408, pls. 5, figs. 11*).—This continuation of the work previously noted (E. S. R., 27, p. 51) deals with the Leporidæ, or hares and rabbits; the Muscardinidæ, or dormice; and the Muridæ, or mice and rats, of the Rodentia.

Use and value of wild birds to Texas farmers and stockmen and fruit and truck growers, H. P. ATTWATER (*Texas Dept. Agr. Bul. 37 (1914), pp. 61, figs. 17*).—A compilation from various sources.

The growth and organization of applied entomology in the United States, P. J. PARROTT (*Jour. Econ. Ent., 7 (1914), No. 1, pp. 50–64*).—This, the address of the president of the American Association of Economic Entomologists, deals with the utilitarian development of entomology, history of state aid in applied entomology, the prominence of entomology in federal aid to agriculture, extension of scope of applied entomology, promise in new broad projects, etc.

A simple and economical method of filing entomological correspondence, W. NEWELL (*Jour. Econ. Ent., 7 (1914), No. 1, pp. 87–91, pl. 1*).—A description of the author's method.

Ninth annual report of the state entomologist and plant pathologist for 1913, G. M. BENTLEY (*Ann. Rpt. State Ent. and Plant Path. Tenn., 9 (1913), pp. 120, figs. 32*).—In addition to the details relating to nursery inspection work, etc., brief accounts are given of the insects doing the most damage in 1913, poultry pests and how to control them, destructive melon, cucumber, and cantaloup insects, insecticides, etc.

Ninth report of the state entomologist and plant pathologist of Virginia, W. J. SCHOENE (*Rpt. State Ent. and Plant Path. Va., 9 (1912–13), pp. 66, figs. 23*).—The first part of this report, relating to details of inspection work, etc.,

is followed by accounts of the round-headed apple tree borer (pp. 28–40), the fruit tree bark beetle (pp. 41–48), and plant lice (pp. 49–66) by E. A. Back.

List of insect pests of cultivated plants in southern India, T. B. Fletcher (*Dept. Agr. Madras Note No. 1 (1913), pp. 15*).—This paper lists 275 insect enemies of crops in southern India.

The enemies of chicory (Cichorium), P. Noel (*Bul. Lab. Régional Ent. Agr. [Rouen], No. 3 (1913), pp. 5, 6; abs. in Rev. Appl. Ent., 1 (1913), Ser. A, No. 7, p. 256*).—A list is given of the insect pests of varieties of this plant.

Tobacco insects in Hawaii, D. T. Fullaway (*Hawaii Sta. Bul. 34 (1914), pp. 20, figs. 9*).—This paper supplements the information contained in the bulletin on tobacco insects by Van Dine, previously noted (E. S. R., 17, p. 785). It deals with the distribution, life history, habits, means of control, and natural enemies of the more important tobacco pests. The principal insects dealt with are cutworms, splitworms, pod borer, hornworm, flea beetle, and cigarette beetle.

The larvæ of 8 of 35 species of Noctuidæ known to occur on the island are said to be commonly found in cultivated fields, *Caradrina reclusa* being the species most commonly found in the tobacco fields in Hawaii. The parasites of cutworms are said to be fairly efficient. The injury caused by the splitworm in the field is said to be slight on well-conducted plantations, only the two or three lower leaves being injured. It is, however, a source of injury in the seed bed. The braconid *Chelonus blackburni* and the ophionid *Limnerium blackburni* are important parasitic enemies.

The cotton bollworm (*Heliothis obsoleta*), known in Hawaii as the tobacco pod borer, does not attack corn or cotton on the island, and is not generally considered a serious pest of tobacco. The tobacco hornworm is extremely uncommon and has never been observed by the author on tobacco. The tobacco flea beetle does not seem to be much of a pest on the commercial plantations, except late in the growing season, but in neglected tobacco it becomes very numerous.

The minor pests briefly mentioned include *Plusia chalcites*, *Amorbia emigratella*, *Pseudococcus citri*, *P. virgatus*, *Siphanta acuta*, *Pulvinaria psidii*, *Elimæa appendiculata*, *Xiphidium varipenne*, *Nysius delectus*, and *Xylcborus* sp.

The bulletin concludes with a brief account of the cigarette beetle.

Grasshopper control work in western Kansas, G. A. Dean (*Jour. Econ. Ent., 7 (1914), No. 1, pp. 67–73, pls. 2*).—In describing the work as carried on in western Kansas the author estimates that the farmers fed almost a thousand tons of poisoned bran mash to grasshoppers in 1913. A close examination of the grasshopper situation made at the close of the season convinced the entomologists and farm demonstration agents that there were fewer grasshoppers in western Kansas than for many years. It is stated that from 60 to 80 per cent of the grasshoppers were killed by the poison bran mash and the remainder were so left to the mercy of the parasitic and predaceous enemies that only a few escaped.

Thrips injury to tobacco, H. Jensen (*Jaarb. Dept. Landb., Nijv. en Handel Nederland, Indië, 1911, p. 248, pl. 1*).—This article relates to a leaf injury of the tobacco plant in Java by *Thrips* sp.

A little-known lantern fly injuring corn (Peregrinus maidis), W. A. Thomas (*South Carolina Sta. Bul. 174 (1913), pp. 7, figs. 3*).—During the course of investigations of the cotton root louse, conducted in cooperation with the Bureau of Entomology of this Department, for the past 3 years, observations have been made of *P. maidis*, which is becoming recognized as a serious pest of late corn in the Pee Dee section of South Carolina.

The injury occasioned by the insect is caused through puncturing and sucking the juices from the leaves and tender stalks. The first appearance of the injury is usually noticed on the upper surface of the midribs, near their junction with the stalks, the punctures in these tissues appearing as small whitish spots. Within a few days after the attack the leaves on these stalks become parched and dry and the entire stalk has the appearance of having been killed by a heavy frost. In cases where the infestation is lighter only the buds and upper portion of the stalks are killed, leaving some of the lower leaves still green, and where it is very light the foliage turns yellow.

At Marion eggs deposited September 5 hatched 9 days later, and the nymphs, after molting 5 times, became mature on September 30, thus completing the life cycle from egg to maturity in 25 days.

A 10 per cent kerosene emulsion or whale-oil soap at the rate of 1 lb. of soap to 5 gal. of water is recommended as a control measure.

Since it is a habit of this insect to pass the fall and early winter under shucks on the old cornstalks remaining in the fields and gardens, cutting and plowing under all the stalks immediately after the corn has been harvested is found to be an important control measure.

The rose aphis, H. M. Russell (*U. S. Dept. Agr. Bul. 90 (1914), pp. 15, pls. 3, figs. 4*).—This bulletin reports the results of studies that were commenced in Los Angeles in 1910 and later carried on to some extent at Washington, D. C.

The rose aphis is said to be distributed over the entire United States and also occurs in Europe, from which country it was first described. Observations of its life history, both at Los Angeles and in a greenhouse at Washington, D. C., are reported. It is estimated that in greenhouses there are from 25 to 30 generations annually and in the open 12 or more.

Under natural control mention is made of rains, heat, birds, and parasitic and predaceous insects. A braconid (*Ephedrus incompletus*) was reared from the aphis at Washington, D. C., in 1912. During the year 1910 five different species of Syrphidæ were reared from the larvæ feeding on this aphid, namely, *Syrphus ribesii, S. opinator, Allograpta frocta, Eupeodes volucris*, and *Lasiophthicus pyrasti*.

In the experiments reported nicotin sulphate at a dilution as high as 1:1400 was much more effective against the rose aphis when used in combination with whale-oil or other soap, since the spreading action thus induced is much more favorable. It was found that in the greenhouse lower strengths of nicotin sulphate can be used, and that 1 part to 2,000 of water will not injure the rose plant if applied on a dark day or late in the afternoon so that the plants will not be exposed to reflected sunlight through the glass.

The cotton root louse (Aphis maidi radicis), W. A. Thomas (*South Carolina Sta. Bul. 175 (1914), pp. 3*).—A brief popular account of this cotton pest.

On the biology of aphidid pests of tree and bush fruits, V. V. Dobrovliansky (*K Biologii Tlei Plodovykh Derev'ev i Iagodnykh Kustov. Kief: Kiev Ent. Stantsiia Iazh. Russ. Obshch. Pooshch. Zeml. i Selsk. Promysh., 1913, pp. 48; abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 2, pp. 79–82*).—A report of studies made in the vicinity of Kief in 1914, particularly of *Aphis pomi*.

Plant louse notes from California, W. M. Davidson (*Jour. Econ. Ent., 7 (1914), No. 1, pp. 127–136, figs. 8*).—Descriptive notes on a number of species, including several new to science.

The life history of the sugar beet root louse (Pemphigus betæ), J. R. Parker (*Jour. Econ. Ent., 7 (1914), No. 1, pp. 136–141*).—"Wingless viviparous females are found in the ground the year around upon the roots of beets, weeds, and grasses. In the fall winged individuals are produced which fly to cottonwood trees and deposit the true sexes. The sexes mate and the female

deposits a single winter egg in the crevices of cottonwood bark. The following spring the young louse hatching from the egg ascends the trees, forms a gall, in which a single generation of lice is produced, all of which are winged and become the summer migrants. The summer migrants fly to beets, weeds, and grasses and upon the leaves of such plants give birth to young which descend to the roots and start new colonies of winged viviparous females."

The San José scale in Nova Scotia, R. MATHESON (*Jour. Econ. Ent., 7 (1914), No. 1, pp. 141–147, fig. 1*).—A discussion of the present status of this pest in Nova Scotia where it was first discovered in the spring of 1911 on nursery stock planted the preceding year, thus proving that it can survive the winter there.

A new cotton scale from Panama, T. D. A. COCKERELL (*Jour. Econ. Ent., 7 (1914), No. 1, p. 148*).—A new species from cotton is described as *Icerya zeteki*.

Outline of the work on the gipsy moth and brown-tail moth conducted by the Bureau of Entomology, U. S. Department of Agriculture, A. F. BURGESS (*Jour. Econ. Ent., 7 (1914), No. 1, pp. 83–87*).—A brief summary of the work now under way.

What Massachusetts has accomplished for science in her fight against the gipsy and brown-tail moths, F. W. RANE (*Proc. Soc. Prom. Agr. Sci., 34 (1913), pp. 59–63*).—A paper presented before the annual meeting of the Society for the Promotion of Agricultural Science, held at Washington, D. C., November 11, 1913.

The parasitism and reproduction of Empusa elegans n. sp., B. MAJMONE (*Centbl. Bakt. [etc.], 2. Abt., 40 (1914), No. 1–8, pp. 98–109, pls. 5*).—This is a report of studies of a new species of Empusa, found to attack and cause the death of caterpillars and pupæ of the brown-tail moth in the Province of Campobasso, Italy, which is described as *E. elegans*. This fungus is said to have been so abundant in the fall of 1909 that it caused the brown-tail moth to disappear largely from the Province the following spring.

A bibliography of 35 titles is appended.

Infection experiments with eggs of the nun moth, J. MEVES (*Centbl. Gesam. Forstw., 39 (1913), No. 1, pp. 18–25*).—The author finds that nun moth caterpillars which emerge from eggs, the shells of which have been infected by caterpillars which died the previous year from wilt disease, consume the infection with the shell and die within a period of 11 days after emergence. The infection can be transmitted by these caterpillars during their lifetime to other caterpillars with which they come in contact. The virus can also be transmitted from those which died the same or the previous year to healthy caterpillars occurring in the vicinity without direct contact. Individual caterpillars may be immune to the disease.

The Sporotrichum fungus and Arctia caja caterpillars, J. PASTRE (*Bul. Agr. Algérie et Tunisie, 19 (1913), No. 13, pp. 283, 284; abs. in Rev. Appl. Ent., 1 (1913), Ser. A, No. 11, p. 419*).—It is reported that in the vineyards of Hérault the young larvæ of this lepidopteran are often found dead or in a swollen and flabby condition as a result of the attack of *Sporotrichum globuliferum*, which supplements the work of the insect parasites, *Apanteles caja*, *Degceria funebris*, and *Erynnia vibrissata*. Artificial propagation experiments have given poor results, the fungus apparently affecting only the first generation of the larvæ.

A contribution to the study of the chemical composition of the silkworm at different stages of its metamorphosis, R. INOUYE (*Jour. Col. Agr. Imp. Univ. Tokyo, 5 (1912), No. 1, pp. 67–79*).—"The chemical composition of the silkworm is greatly changed in producing the cocoon, while the difference be-

tween the pupa and moth is not so striking. The silkworm never loses its nitrogen in gaseous form while metamorphosing. Fat is accumulated when the silkworm pupates, but during the pupal and moth stage the greater part of it is consumed."

The amount of nitrogen in the phosphotungstic acid precipitate is much smaller in every stage of the metamorphosis than the nitrogen in the filtrate therefrom. In the cocoon the amount of nitrogen precipitable by phosphotungstic acid is very small. "In the pupal and moth stage the waste of body protein is repaired with amino acids, and a part of the latter is further transformed into ammonia. Splitting of the protein in the silkworm is caused by the action of some proteolytic enzym."

The maize pyralid (Pyrausta nubilalis), A. VUILLET (*Rev. Phytopath. Appl., 1 (1913), No. 8, pp. 105–107, fig. 1; abs. in Rev. Appl. Ent., 1 (1913), Ser. A, No. 11, pp. 409, 410*).—The caterpillars of *Chloridea obsoleta*, *Laphygma exigua*, and others, particularly *P. nubilalis*, are said to be the chief enemies of corn plants in southwestern France. It appears that *P. nubilalis* has but few or no parasitic enemies.

Biological and economic notes are presented.

The control of the codling moth in the Pecos Valley in New Mexico, A. L. QUAINTANCE (*U. S. Dept. Agr. Bul. 88 (1914), pp. 8, figs. 4*).—This bulletin reports the results of experiments with control measures carried on during 1912 and 1913 by the late A. G. Hammar and his assistants under the direction of the author. The results of work carried on in an orchard at Roswell, N. Mex., are presented in detail.

The plat which received a total of 3 applications of an arsenate of lead spray gave 95.13 per cent sound fruit. The plat with 4 applications yielded 98.72 per cent of sound fruit, and that which received 5 spray applications, 99.39 per cent. The unsprayed plat showed only 40.77 per cent of the fruit free from codling moth injury. It has been found that in New Mexico the calyx lobes of the small fruit may remain open in suitable condition for calyx spraying for a period of from 2 to 3 weeks, thus differing somewhat from the East where a period of only about 10 days follows the dropping of the apple blossoms before the calyx lobes close.

The results have led the author to recommend that the first application, consisting of 6 lbs. of arsenate of lead to 200 gal. of water, be made as soon as the petals have fallen; the second application, consisting of 8 lbs. of arsenate of lead to 200 gal. of water, about 2 weeks after the falling of the petals; and the third application at the same strength 8 or 9 weeks after the falling of the petals.

Lesser bud moth, E. W. SCOTT and J. H. PAINE (*U. S. Dept. Agr., Jour. Agr. Research, 2 (1914), No. 2, pp. 161, 162*).—The occurrence of the lesser bud moth (*Recurvaria manella*) was noted during the spring of 1912 while the authors were engaged in apple spraying experiments at Benton Harbor, Mich. The injury caused is said to have been severe in a neglected orchard at that place, this insect being the most important factor in the destruction of the entire crop of fruit. The character of the injury, the attack on the swelling buds, and the tying together of the growing leaves led the authors to attribute the damage to the eye-spotted bud moth, but studies the following year led to the identification of the pest and the discovery of an insect the economic importance of which had not previously been recorded in the United States.

The authors' observations of the life history of this pest are said to correspond in detail with those of Houghton in England in 1903 (E. S. R., 15, p. 787). A brief review of the literature consisting of 6 titles follows.

The so-called tobacco wireworm in Virginia, G. A. RUNNER (*U. S. Dept. Agr. Bul. 78 (1914), pp. 30, pls. 2, figs. 5*).—This is a report of studies of the tobacco Crambus (*Crambus caliginosellus*) conducted during the last 4 years largely at a field station at Appomattox, Va.

This pest occurs throughout the eastern United States from Canada south to the Gulf Coast States, and in most, if not all, of the tobacco-growing districts of the Eastern States, but appears to be most destructive in certain sections of Maryland and Virginia, and especially in the famous "dark tobacco district" of the Piedmont section of middle Virginia. In Virginia the damage to the tobacco crop alone by the insect is estimated to average at least $800,000 annually, and it is also the source of considerable injury to the corn plant.

Tobacco is attacked soon after planting, and feeding by the larvæ continues until the first or second week in July. As feeding continues the larvæ, which commence operations just below the surface of the ground, frequently enter the stalk and tunnel upward, the burrows often extending to the base of the first leaves. Although the plants often partially recover they do not attain full growth. In their attack upon corn the larvæ commence near the surface of the ground and burrow into the base of the stalks, the outer portion of the stalk being frequently girdled. Injury to corn has been noted in many localities where little tobacco is grown and its damage to this crop probably amounts to more than that to tobacco.

Technical descriptions are given of the several stages of this species and a detailed report of life history studies.

At Appomattox the moths which emerge during the summer appear in greatest numbers during the first and second weeks in August. There appears to be but a single generation a year.

The eggs, which are deposited in weedy fields during July and August, hatch in a few days. The larvæ remain in the soil over winter and complete their growth during June and July of the following year, feeding most actively at the time the tobacco or corn is planted. The injury to these crops occurs when they are planted on land which was weedy during the previous season, crops planted on land which has been under clean cultivation being immune. Buckhorn plantain, oxeye daisy, stickweed, and whitetop are the weeds which have been found to be the most common natural food plants of the worms.

Several carabid beetles are mentioned as natural enemies. The subterranean habits and the protection afforded by the loose web in which the worms usually lie when not feeding appear to protect them largely from parasites. The investigations show that the worms when once established in land where their natural food plants are abundant are difficult to control. Various insecticides and repellents have been tested but without satisfactory results. Fall or winter plowing has been found to reduce the injury but is only partially effective, as most of the weeds remain alive and furnish food for the larvæ until the tobacco or corn is planted. "Damage is best prevented by crop rotations, or by cultural methods that prevent growth of the weeds which are food plants of the worms, thus making conditions unfavorable for egg deposition by the moths the summer before tobacco or corn is planted. Summer plowing, thorough preparation of weedy land, and the growing of crops of cowpeas or crimson clover, preferably cowpeas, the year before crops subject to injury are planted, have been found to be most satisfactory and practical means of control."

A bibliography of 19 titles is appended.

A new fruit boring caterpillar of bananas occurring at Tweed Heads (Heteromicta latro), E. JARVIS (*Queensland Agr. Jour., n. ser., 1 (1914), No. 4, pp. 280–284, fig. 1*).—This lepidopteran, hitherto unrecorded as of economic

importance, is said to have caused damage to green Cavendish bananas in the locality of Tweed Heads.

Disease-bearing mosquitoes of North and Central America, the West Indies, and the Philippine Islands, C. S. LUDLOW (*War Dept. [U. S.], Off. Surg. Gen. Bul. 4 (1914), pp. 97, pls. 30, figs. 30*).—Following a brief introduction descriptions are given of 11 species of Anopheles, 7 of Myzomyia, 3 of Pyretophorus, 4 of Myzorhynchus, 3 of Nyssorhynchus, 4 of Cellia, and 1 each of Cycloleppteron and Stethomyia, of the Anophelinæ; and of 4 species of Culicinæ. This is followed by a brief account of breeding places, life history, collecting and collections, and a discussion of dissecting and staining.

American black flies or buffalo gnats, J. R. MALLOCH (*U. S. Dept. Agr., Bur. Ent. Bul. 26 (1914), tech. ser., pp. 71, pls. 6*).—This is a synopsis of the Simulidæ, a group of flies of considerable economic importance as direct enemies of man and domestic animals and, indirectly, through the rôle that they may play in the transmission of disease.

Five species of Prosimulium, 1 of Parasimulium n. g., and 31 of Simulium are recognized as occurring in North America and Central America, of which 14 species are characterized for the first time.

A list of the principal papers dealing with the life histories of American Simulidæ is appended.

The reproductive organs and the newly hatched larva of the warble fly (Hypoderma), G. H. CARPENTER and T. R. HEWITT (*Sci. Proc. Roy. Dublin Soc., n. ser., 14 (1914), No. 19, pp. 268–289, pls. 6, fig. 1*).—This is an anatomical study of the genitalia and larva of Hypoderma. A bibliography of 21 titles is included.

Mahogany borers of the Gold Coast, T. F. CHIPP (*Roy. Bot. Gard. Kew, Bul. Misc. Inform., No. 2 (1913), pp. 72–75, figs. 6*).—A brief account of injury by a borer belonging to the genus Xylotrya.

The Colorado potato beetle migrating to the Pacific coast, F. H. CHITTENDEN (*Jour. Econ. Ent., 7 (1914), No. 1, p. 152*).—The author reports the receipt of specimens of *Leptinotarsa decemlineata* from Colton, Wash.

The biology of Rhynchytus auratus, N. N. TROITZKY (*Materialy po Biologii Vishnevago Slonika. Tashkend: Turkest. Ent. Stantsiia, 1913, pp. 49, pls. 2; abs. in Rev. Appl. Ent., 1 (1913), Ser. A, No. 11, pp. 438–441*).—A detailed description is given of this weevil, which occurs in the southern and southeastern parts of European Russia, in the Crimea and the Caucasus, and in the territories of Middle Asia.

The pest appears in orchards at Tashkend at the beginning of April after having hibernated in the adult stage. The weevils stay on the lower parts of stems of cherry trees, from whence they gradually spread over the crown of the tree, feeding on the blossoms and buds and later on the fruit. In the governments on the Volga they feed on plums, apricots, apples, pears, prunes, thorns, and even gooseberries. Various methods of control are suggested.

The biology of Bruchus chinensis, R. SCHANDER and K. BOSS (*Mitt. Kaiser Wilhelms Inst. Landw. Bromberg, 6 (1914), No. 2, pp. 125–132, pl. 1*).—Studies of the cowpea weevil are reported.

Apiary inspection (*Sess. Laws Colo., 1913, pp. 24–27*).—The text of an act establishing a division of apiary inspection and investigation under the state entomologist is presented. Its duties will include the protection of bees from contagious diseases, the prevention and spread of bee diseases, the employment of county apicultural inspectors, the transfer of bees from box hives, the prevention of the poisoning of bees by fruit tree sprays, etc.

The temperature of the honeybee cluster in winter, E. F. PHILLIPS and G. S. DEMUTH (*U. S. Dept. Agr. Bul. 93 (1914), pp. 16, figs. 2*).—This pre-

liminary report presents the results of the first season's work on the behavior of bees during the winter. The authors have eliminated a source of error, through the use of electrical thermometers in place of mercury thermometers, thus being enabled to take the readings of the temperature of various parts of the hive without opening the hive, or going near to disturb the bees. In all 161,617 temperature readings were made during the winter of 1912–13.

The authors find that "when the temperature of a colony of undisturbed broodless bees is above 57° F. and below about 69° the bees are quiet and their temperature drifts with the outer temperature; at lower temperatures they form a compact cluster, and the temperature within it is raised by heat generated by the bees." While the lower critical point, 57°, appears rather well established, it is stated that the observations up to the present do not justify too definite a statement as to the upper limit of quiescence. These conditions do not apply when the colony has brood, since the rearing of brood in winter causes a marked increase in heat production and constitutes a condition which may become one of the most disastrous that can befall a confined colony.

The studies indicate that dextrin can not be digested by bees. Thus honeydew honey causes a rapid accumulation of feces which usually results in the condition known as dysentery, in bad cases of which the feces are voided in the hive. "The accumulation of feces acts as an irritant, causing the bees to become more active and consequently to maintain a higher temperature. We are therefore justified in believing that the cause of poor wintering on honeydew honey is due to excessive activity, resulting in the bees wearing themselves out and ultimately in the death of the colony. . . . The accumulation of feces due to confinement causes increased activity and this in turn is the cause of excessive heat production, resulting in a reduction in the vitality of the bees. . . . While the activity of the cluster is greater at some times than at others, there are not, as has been held, regular intervals of activity at which the colony rouses itself to take food. At no time is a colony kept at a room temperature of 45° or less in a condition which can be characterized as inactive. . . . Poor food is evidently a more serious handicap than low temperature."

The authors state that it is clear that the heat for the warming of the cluster is produced by muscular activity. "It is at least evident from the records obtained in this work that colonies of bees in winter, either in cellars or out of doors, should be disturbed as little as possible. This appears to apply especially to cold weather out of doors or in the cellar, especially after the colony has been confined for some time."

Destruction of germs of infectious bee diseases by heating. G. F. WHITE (*U. S. Dept. Agr. Bul. 92 (1914), pp. 8*).—In this bulletin the author summarizes the results of 55 heating experiments carried on during the last two years.

When maintained for 10 minutes the minimum temperatures that can be used for destroying the germs of the four bee diseases now known to be infectious apparently are approximately 63° C. (145.4° F.) for European foul brood, 98° for American foul brood, 58° for sacbrood, and 57° for Nosema disease.

"It is probable that future experiments may cause slight changes to be made in these conclusions. Nothing more than a comparatively slight variation is to be expected, however. In practice the beekeeper, in destroying these germs by heating, will naturally use a quantity of heat somewhat in excess of the minimum amount that is absolutely necessary."

Dipterous enemies of the Melipona bees, R. RAMIREZ (*Bol. Dir. Gen. Agr. [Mexico], Rev. Agr., 2 (1912), No. 6, pp. 533–535, pls. 2*).—*Phora incrassata* and *P. aterrima* are mentioned as enemies of the immature stages of Melipona bees.

Occurrence of the Argentine ant in Texas. W. NEWELL (*Jour. Econ. Ent., 7 (1914), No. 1, p. 153*).—*Iridomyrmex humilis* was found throughout a considerable portion of the business and residential sections of Beaumont, Tex., on January 5, 1914.

A natural enemy of the Argentine ant. W. NEWELL (*Jour. Econ. Ent., 7 (1914), No. 1, p. 147*).—*Eciton (Acamatus) schmitti* has been found to be very active in raiding colonies of *Iridomyrmex humilis*, destroying the adults and carrying off the larvæ and pupæ in the Louisiana citrus growing section.

Calliephialtes in California, H. S. SMITH and E. J. VOSLER (*Mo. Bul. Com. Hort. Cal., 3 (1914), No. 5, pp. 195–211, figs. 15*).—This is a report of studies of this codling moth parasite in California which were commenced in the spring of 1913. The information presented is supplementary to that by Cushman in an article previously noted (E. S. R., 30, p. 360).

"On account of the wide differences in handling the apple crop in California and that of the native habitat, the physical limitations of the parasite, the fact that the birds destroy a large percentage of the codling moth larvæ, and the habits of the codling moth larvæ seeking hibernating quarters, we believe that *Calliephialtes* sp. will be of no practical value in controlling the host."

Some information on the parasites of the eggs of Eurygaster integriceps, N. A. DOBROVOLSKI (*Ent. Vïestnik [Kief], 1 (1913), No. 2, pp. 229–236; abs. in Rev. Appl. Ent., 1 (1913), Ser. A, No. 11, pp. 450, 451*).—The proportion of eggs parasitized in the Government of Kharkof was found to vary from 88 to 96 per cent, from 37.5 to 68 per cent being parasitized by *Telenomus semistriatus*, 26.7 to 50 per cent by *T. sokolori*, and 1.3 to 8.8 per cent by a new species.

The Tenthredinoidea of Argentina. P. JÖRGENSEN (*An. Mus. Nac. Hist. Nat. Buenos Aires, 24 (1913), pp. 247–288, pls. 3, fig. 1*).—This paper includes descriptions of 3 genera and 13 species new to science.

Ammonia gas as a fumigant. D. E. FINK (*Jour. Econ. Ent., 7 (1914), No. 1, pp. 149, 150*).—Three oz. of concentrated ammonia, placed in a fumigation box of $8\frac{2}{3}$ cu. ft. capacity with 6 qt. bags of cowpeas containing living weevils, resulted in 100 per cent mortality. The same amount placed in the same box with a 50-lb. bag of cowpeas and an exposure of 48 hours gave from 75 to 85 per cent mortality.

FOODS—HUMAN NUTRITION.

The milling and baking qualities of Victorian wheat, A. E. V. RICHARDSON, P. R. SCOTT, and F. H. WINSLOW (*Jour. Dept. Agr. Victoria, 11 (1913), Nos. 9, pp. 521–533, figs. 6; 10, pp. 625–639, figs. 6; 12, pp. 755–765, figs. 2*).—In the first of these papers the small milling plant and electric baking oven and the laboratory equipment installed in the Victoria Department of Agriculture, for use in milling and baking tests with Victorian wheats and flours, are described, the structure of wheat discussed, and some analytical data reported.

A representative composite sample of Victorian wheat (1911–12) of "fair average quality" had, according to the authors, the following percentage composition: Water, 10.43; protein, 11.26; crude fiber, 2.32; nitrogen-free extract, 71.97; ether extract, 2.79; and ash, 1.23. As shown by the average of 10 typical Victorian wheats, the total ash was made up as follows: Ferric oxid, 0.5; alumina, 0.58; brown oxid of manganese, 1.62; lime, 3.72; magnesia, 14.61; potash, 29.93; soda, 3.24; chlorin, 0.9; sulphuric anhydrid, 3.02; phosphoric anhydrid, 40.87; and silica, 1.51 per cent; a total of 100.5 per cent, or 100 per cent when 0.5 per cent oxygen (=chlorin) is deducted. The chemical testing of flour is described in detail.

In the second paper the methods followed in milling wheat and testing flour are described at length, the descriptions being elucidated by data comparing Victorian with New South Wales and South Australian wheats.

"The New South Wales sample was intermediate in bushel weight, gave slightly less flour than either of the other wheats, but the quality of the flour was superior to either Victorian or South Australian. The protein content of both wheat and flour were comparatively high, the gluten content and water absorption higher than either of the other samples. The flour on baking gave an excellent loaf of good texture and color, and the volume and pile were very good.

"The Victorian sample gave the highest bushel weight, and yielded the greatest quantity of flour, but the flour contained slightly more moisture than the other samples. It had the lowest protein and gluten content and the lowest ratio of soluble nitrogen to total nitrogen. On the other hand, the yield of bread was good, and the volume and texture excellent.

"The South Autralian sample was lowest in bushel weight, intermediate in yield of flour, moisture, protein, and gluten content. The dough did not rise to the same extent as either Victorian or New South Wales, and the volume and pile of the loaf were slightly poorer than either of the other flours."

In the third paper milling and baking tests made with 32 samples of typical Australian varieties of wheat grown at two experiment stations during the season 1912–13 are discussed.

According to the authors' summary, "the percentage of straight grade flour produced from the samples, and this in a large measure determines the value of the grain, varied from 68.7 per cent in the case of King Early to 73.5 per cent with Yandilla King. The break flour varied from 1.4 per cent with Huguenot to over 12 per cent with White Tuscan and Dart Imperial. Break flour, as a rule, has a determining effect in the color of the flour, the more break flour the poorer the color.

"Similar variations were noted with respect to the amount of water required to bring the grain into condition for milling. The maximum, 9 per cent, was required for the flinty durum varieties—Kubanka and Huguenot—while the minimum, 3 per cent, was required by soft varieties like Dart Imperial and Yandilla King."

Considerable differences were noted with respect to the volume of the loaf, and the authors consider it questionable whether the best results are obtained from high strength flours by baking them under the same conditions as low strength flours, which formed the bulk of the types tested. "The yield of bread varied from 461 to 480 gm. per standard loaf, and the volume from 1,310 cc. to 1,710 cc. What is more important still, the texture and quality of the loaves varied very considerably in the different varieties."

As pointed out, the moisture absorbed in the process of conditioning is ultimately retained in the milling products, and so the amount absorbed by different varieties is of some importance to the miller. The moisture content of Australian wheats is low, and a considerable amount is absorbed in storage in a grain shed or during transportation to Europe. The amount so gained is of direct value to the wheat exporter.

"The amount gained during storage or transportation to England largely depends, of course, on the locality in which the wheat is grown. From evidence submitted to the South Australian Royal Commission on the marketing of wheat, it would appear that the increase of weight accruing from storage for a period of 6 months amounted to from 0.75 to 3.5 per cent of the total weight of wheat."

In addition to the milling and baking tests, a special study was made of the protein and gluten content of the wheats under consideration. The protein varied from 10.31 per cent with Marshall No. 3 to 14.68 per cent with Thew, and a similar range was noted in the case of the protein content of the flour,

the extremes being 9.43 per cent with Kubanka and 13.31 per cent with Thew. "The figures for dry gluten range from 7.79 per cent to 10.44 per cent. The gluten content of the standard sample was 7.81 per cent. The variations in strength or water absorption capacity of the flour range from 42 in the case of King Early to 57.2 per cent in the case of Cedar."

The effects of climatic conditions, soil, and variety are discussed with reference to the wheats under consideration.

Wheat and flour, R. HARCOURT (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 38 (1912), pp. 48–50*).—A brief account is given of the year's work in wheat and flour, together with the numerical data of baking tests of spring wheats grown on the college experimental plats in 1911, in comparison with earlier work.

Rice polishings or tiqui-tiqui (darac) (*Ann. Rpt. Bur. Health P. I., 14 (1912–13), pp. 20, 21*).—A brief summary is given of a study of the possible use of rice polishings as porridge.

As obtained from the mill the sample contained grit, insects, and other foreign substances, of which the coarser portions could be removed by sifting. "In this condition the product could no doubt be eaten without actual damage, though the possible presence of insect remains is revolting. If clean, tiqui-tiqui could doubtless be prepared in the same manner as corn meal and other non-glutinous farinaceous products."

The study was undertaken because of the importance of rice polishings in combating beri-beri. The conclusion reached was that "in view of the difficulties that would be encountered in making tiqui-tiqui a palatable food, it is . . . better to make a trial of yeast, which recent laboratory work seems to show possesses the same properties as tiqui-tiqui as a cure or preventive for beri-beri, and as yeast could be more easily administered, trials with the latter are soon to be made."

Analyses of two samples of chick peas (Cicer arietinum), N. PASSERINI (*Bol. Ist. Agr. Scandicci, 2. ser., 7 (1913), No. 4, pp. 311–314*).—Proximate and ash analyses are reported.

A study of the ripening and putrefaction of meat, D. OTTOLENGHI (*Arch. Farmacol. Sper. e Sci. Aff., 16 (1913), Nos. 9, pp. 403–482, figs. 3; 10, pp. 433–451, figs. 3*).—Full analytical data are presented and the results given of a chemical and bacteriological study of the changes which meat undergoes during the process of ripening and during incipient putrefaction. Methods of chemical analysis are described which, together with bacteriological examination, serve, in the opinion of the author, as a practical means of judging the state of preservation of the meat.

Twenty-sixth annual review of the frozen meat trade, 1913 (*Ann. Rev. Frozen Meat Trade, 26 (1913), pp. 22, pl. 1*).—Statistical and other data are summarized.

Medicated milk, L. GRANATO (*Bol. Agr. [Sao Paulo], 14. ser., No. 6 (1913), pp. 345–362*).—Various medicated milks are described together with their methods of preparation, use, and physiological importance. Tables are given showing the analysis of human milk as compared with that of various animals.

Preliminary report of the dairy and food commissioner for the year 1912, J. FOUST (*Penn. Dept. Agr. Bul. 240 (1913), pp. 56*).—An account is given of the judicial construction of the Pennsylvania state pure food laws, together with a summary regarding a number of foods examined and information regarding the legal work carried on.

Fourth annual report of the board of pure food and drug commissioners, presented to the general assembly at its January session, 1913 (*Ann. Rpt. Bd. Pure Food and Drug Comrs. [R. I.] 4 (1913), pp. 9*).—A brief account of the work carried on during the year.

Pure food and drugs (*Ann Rpt. Comr. Agr., Com. and Indus., S. C., 10 (1913), pp. 195–210*).—A brief account is given of the year's activities in this line of work, together with the report of A. C. Summers, which shows the extent of the analytical work carried on under the state pure food and drug law.

Food and drugs inspection (*Ann. Rpt. Bur. Health P. I., 14 (1912–13), pp. 16–20*).—Out of a total of 369 samples of imported food products and beverages collected at the customhouse, 32 were declared adulterated or misbranded and 80 were rejected. In addition, many examinations were made of food and drugs obtained in the local market.

"An investigation of the coffee sold in the Philippine Islands resulted in establishing the fact that some of the articles sold as coffee contained adulterants such as chicory, cereals, beans, peanuts, etc. Some of these products would have the word 'imitation' printed on the English label, but nothing to indicate the fact in the Spanish or other label. To correct this a circular was issued."

Other work of the board is briefly referred to.

The dairy and pure food laws of the State of Connecticut ([*Hartford, 1913*], *pp. 56*).—A full text of the laws, corrected to the close of the legislative session of 1913.

Pure food and drug laws of Florida (*Tallahassee, Fla., 1913, pp. 42*).—A full text of the amended laws of Florida as approved June 13, 1913.

Standards of purity for food products, department of agriculture, State of Florida (*Tallahassee, Fla., 1913, pp. 35*).—The standards as approved June 13, 1913, are included.

Food and oil laws of the State of Wyoming, with the rules, regulations, and standards of purity for food products (*Cheyenne, Wyo., 1913, pp. 74*).—The full text is given.

Unsterilized vessels in restaurants (*Brit. Food Jour., 16 (1914), No. 181, pp. 3, 4*).—In a discussion of data collected by the London *Times* the dangers which may attend the use of washed but unsterilized silver and table utensils in restaurants is insisted upon and the installation of sterilizers recommended.

Unearthing cellar bakeries in the capitals of Europe, G. M. Price (*Surrey, 31 (1914), No. 20, p. 615*).—According to the author's investigations, unclean cellar bakeries were common in Paris, but this was not the case in London or some other European cities, so far as his observations went.

The American cook book, Janet McK. Hill (*Boston, 1914, pp. 8+255, pls. 16*).—A large number of recipes are brought together for preparing meat, fish, fruits, vegetables, and other foods for the table. The author points out that in the case of recipes "it is well to note the essentials and the nonessentials that make up its content. Nonessentials are usually added for variety in flavor or appearance, and if not agreeable may be eliminated without detriment to the dish; at the same time let no one forget that flavor in food is a prime requisite and it must be brought out or retained in the viand as the case may demand."

The oriental cook book, A. H. Keoleian (*New York, 1913, pp. 349, pl. 1*).—The author states that he has collected at first-hand the recipes from which were selected those presented in this book, which cover the preparation of meats and fish, vegetables, eggs, salads, pickles, pastry, and so on. The oriental order of service is described, some menus are suggested, and a special list of the ingredients for oriental dishes is given.

In this introduction the author points out that there is little regular literature of oriental cookery, which means that the very numerous recipes and culinary procedures have not been standardized. He believes that oriental cookery is valuable not only because it is economical in its methods and use of materials but also because of its nutritious qualities, "and although it is solid and substantial it is often dainty as well." Its good qualities are claimed not to

be dependent upon the extravagant use of numerous and expensive materials, which increase the cost, but upon the use of economical materials with great attention paid to seasoning and flavoring and to careful methods of cookery.

Easy meals, CAROLINE F. BENTON (*Boston, 1913, pp. VII+325, pls. 8*).—The author makes a plea for simple dishes and for their combination into simple meals. Recipes are given and menus illustrating her point of view, including menus for 7 weeks for the different seasons of the year. Among the subjects considered are school luncheons, invalid meals, and catering from a country market.

A one-portion food table, F. A. REXFORD ([*Brooklyn, N. Y.*], *1913, 2. ed., pp. 29, pl. 1*).—The table, which is preceded by some general discussion of diet and dietetics, gives the weight and the protein, fat, and carbohydrate content in ounces and the energy content in calories of individual portions of a large number of animal and vegetable food materials. Charts are also included designed to show the relative economy of different food materials as sources of protein and of energy.

Enameled utensils used in the preparation of food, F. BORDAS (*Ann. Falsif., 7 (1914), No. 63, pp. 49, 50*).—This article calls attention to the possible danger in the use of enameled ware in which meat is chopped, in that small particles of the enamel may become detached and thus find their way with the food into the digestive tract, causing damage to its walls.

A study of the diet and metabolism of Eskimos undertaken in 1908 on an expedition to Greenland, A. and MARIE KROGH (*Meddel. Grönland, 51 (1914), No. 1, pp. 52, figs. 13; rev. in Zentbl. Biochem. u. Biophys., 16 (1914), No. 3–4, pp. 97, 98; Jour. Chem. Soc. [London], 106 (1914), No. 615, I, p. 106*).—The results are reported of an investigation carried on at the Danish Arctic Station for Biological Research in West Greenland. A native man and woman were the subjects, and a respiration chamber of the Jacquet type was used. Among the conclusions reached were the following:

The normal diet of the Eskimos contains extremely large quantities of animal protein (280 gm.) and much fat (135 gm.), with very small quantities of carbohydrates (54 gm.), more than half being obtained in the form of glycogen in the flesh eaten. The Eskimos greatly resemble carnivorous animals in that their meals are few and irregular and when food is eaten it is taken to their fullest capacity. Nevertheless, the diet exercises no bad effect, except occasionally skin eruptions and often nosebleed after food has been taken in large quantities. The physical strength of these Eskimos and their resistance to the unfavorable climatic conditions are very great. It is especially to be noted that uric acid diseases are of extremely rare occurrence.

In the metabolism experiments (which were controlled by respiration experiments), the maximum daily food taken was 1,804 gm. of boiled seal meat (supplying 85 gm. nitrogen and 218 gm. fat), a quantity which is said to be much less than the usual amount of meat taken by Eskimos in the open. This quantity of meat was well assimilated, the loss of nitrogen in the feces being at most 3 to 5 gm. per day. The largest amount of nitrogen excreted in the urine in a day was 53 gm. When under experimental conditions an abundant meat diet was taken after a diet lacking nitrogen or a low-nitrogen diet, only about 60 per cent of the nitrogen was excreted in 24 hours, while the remaining 40 per cent was retained.

Long-continued metabolism experiments were not carried out, but the authors believe that the protein which the retained nitrogen represents is held in the body and later used with little loss as a source of energy. These conclusions are rendered the more probable by the fact that the specific dynamic effect of the protein was low, as shown by the respiration experiments.

The relation of the renal excretion of nitrogen to water secretion is very noticeable when such large quantities of protein are taken.

The respiratory metabolism was always higher in the afternoon than in the forenoon. During the night it was practically constant and in general uninfluenced by the food taken.

Rearing an imperial race: Report of the Second Guildhall School Conference on Diet, Cookery, and Hygiene, edited by C. E. HECHT (*London, 1913, pp. XLVIII+508, pls. 12, fig. 1*).—A full report is given of this conference, which had to do with diet, cookery, hygiene, dietaries, children's food requirements, clothing, and similar topics. Especial attention is paid to the teaching of home economics topics, to malnutrition, to school luncheons, and to similar subjects, particularly with reference to Great Britain, while one section is devoted to a summary of data regarding work along such lines in other countries.

Among the papers presented may be mentioned Food Values, Catering, and Cookery—An Account of the Teaching of These in Connection with the Other Domestic Subjects in Primary Schools under the London County Council, by Catherine R. Gordon; Diet, Cookery, and Hygiene in Philanthropic Residential Institutions for Children and Adolescents, by Edith Butler; How the Family of the Agricultural Laborer Lives, by R. T. Herdman; The Diet of Country School Children, by E. B. Smith; Remarks on the Food Requirements of Children, by C. Watson; The Bradford Feeding Experiment—Report on a Course of Meals Given to Necessitous Children from April to July, 1907, by R. H. Crowley and Marian E. Cuff; and How Edinburgh Feeds and Clothes Her School Children, by J. W. Peck.

An exhibit of material bearing upon the subjects under consideration was also arranged. The volume as a whole contains a large amount of data with respect to the general question of work in home economics in England.

For the previous conference, see an earlier note (E. S. R., 29, p. 363).

The cost of living of the laboring classes in the important industrial countries: England, Germany, France, Belgium, and the United States, C. VON TYSZKA (*Die Lebenshaltung der arbeitenden Klassen in den bedeutenderen Industriestaaten: England, Deutschland, Frankreich, Belgien und Vereinigte Staaten von Amerika. Jena, 1912. pp. 69*).—A comparison is made of the wages paid in a number of the principal cities of each country in the building, metal working, shipbuilding, and printing trades, and in the mining, textile, and wood working industries. The prices of rents and food materials are compared together with the budgets of the families of working people in the various countries.

[Cooperative buying for] the Home Hospital experiment, J. A. KINGSBURY (*Survey, 31 (1914), No. 19, pp. 583–588, figs. 8*).—A cooperative store is maintained as a part of the home for families made dependent by tuberculosis, which was established by the New York Association for Improving the Condition of the Poor, as a 3-year demonstration experiment for the combined treatment of this disease and poverty. The institution is a combination of home and hospital. The well members of the families work and the sick are given treatment.

The average cost of food under the plan of cooperative buying has been reduced during the first year of operation from $1.30 to 93 cts. per day. The administration and supervision charges amount to 20 cts. per person per day for all members, both sick and well. Details are given of the other expenditures.

The budget of the Home Hospital "furnishes a fair basis for computing the cost of maintaining a decent home and providing a comfortable living

for an average family of 5 persons, father, mother, and 3 children under 14 years of age, in New York City at the present time." It indicates that such a family can live under ordinary conditions fairly comfortably in New York on from $1,050 to $1,150 per year, and "that an income of between $1,100 and $1,200 is probably necessary for an average family to maintain unaided a normal standard of living . . . —that is to say, for a family to live in such a way as to preserve health, mind, character, self-respect, and proper conditions of family life."

Advantage is taken of the diet kitchen of the hospital to give instruction to the women in the preparation of food, and instruction has also been given in personal and home hygiene and in the care of children.

The summary gives details of the success of the project as a sociological experiment and information of interest in connection with the general subject of institution management.

[Cooperative grocery of the New York Association for Improving the Condition of the Poor] (*Survey, 31 (1914), No. 21, pp. 636, 637*).—A brief description is given of the project recently instituted by this society for the purchase and distribution of the groceries required for its relief work.

"The new method is simply that of buying wholesale, and of running a store of the association's own, where the visitor orders her food instead of getting it at the corner grocery." In the first 10 weeks a net saving of 22.8 per cent was effected, the total expenditure being $6,866.22. Each association visitor makes out her food orders daily, using the association dietitian's guides, which indicate the supplies needed in a unit of time for families of different sizes and circumstances. Orders are filled and delivery made on the following day.

Emergency demands are still met by purchase in the ordinary way, cases requiring haste being under 10 per cent of the total. "The store is serving also as a laboratory in experimenting with problems relating to the purchase and distribution of food."

It is stated that this enterprise grew out of the success of the association's cooperative project described above.

The fundamental basis of nutrition, G. Lusk (*New Haven, Conn., and London, 1914, pp. 6+62*).—Following a historical introduction, the author discusses the body's constant need for fuel and protein; habits of diet; and beriberi, which is classed as a nutritional disease due to a deficiency in the diet of a substance or substances for which the name "vitamin" has been proposed.

In the final chapter, on the monetary value of foods, data collected by F. C. Gephart regarding the cost and nutritive value of the portions of various foods sold from the counter of a well-known chain system of restaurants in New York and other cities are included which serve to emphasize the extreme variability of the purchasing power of money when expended for food. In general, the author proposes that foods should be sold on the basis of their energy value and of the proportion of the total energy contributed by proteins. "The proteins of the foodstuffs could be labeled A, B, and C according to their physiological value, and to group D might belong gelatin and some other proteins which can not replace the body protein that is continually wearing away." The relative value of different proteins, as determined by the products which they yield on hydrolysis, as well as other recent work on the nature and functions of protein, are discussed.

As the author points out, "since the efficiency of labor depends upon its energy and constant repair, it is certainly of no small moment that the citizen should know how best to maintain the machine at a maximum of efficiency. Not only that, but in times of trouble he should know where to turn to find nourishment in the form which is best and cheapest. . . . If, through the

medium of the schools and the press, everyone knew that a man of sedentary occupation required 2,500 calories and a laboring man 3,000 calories and more, no one suffering from want would spend his money for a can of tomatoes which is little else than flavored water.

"It has been estimated that a family of 5, including the father, a clerk, the mother who does the housework, and 3 children, 9 and 6 years and 1 month old, respectively, requires 7,750 calories per day." Data are presented showing the cost of a diet sufficient to supply this energy, 5 per cent of the total coming from animal proteins of grade A and 10 per cent from vegetable proteins of grade C (bread). The necessary protein to supplement the bread would be supplied by ⅛ lb. salt codfish, ⅜ lb. smoked ham, ⅓ lb. cheese, 2½ lbs. milk, 1½ lbs. loin pork, 1⅓ lbs. of mutton, 1¾ lbs. cod steak (fresh), 1⅓ lbs. sirloin beef, or 1½ lbs. turkey. According to the prices of foods in the New York markets January 28, 1913, the cost of the ration would vary from 47 cts. with bread and salt codfish to 78 cts. with bread and turkey.

"If corn meal, oatmeal, dried beans or rice had been used instead of bread, these prices would have been lower, whereas potatoes would have slightly increased them.

"These figures are for the great staples of diet. . . . It is obvious that when more than an average of 8 cts. is expended for 1,000 calories of nutriment, the diet must include luxuries."

The author estimates that three servants will double and six servants treble the food bill given above. "Whatever is spent above these amounts is paid for waste or for nonessentials in the form of flavors of high price. High cost may also be due to carnivorous indulgence approximating that of the Eskimo. . . . It is not probable that the food values actually consumed are very different in the various well nourished families. Only the cost can vary enormously."

The value for man of the different constituents of food, L. HIRSCHSTEIN (*Ztschr. Phys. u. Diätet. Ther., 17 (1913), No. 8, pp. 453–471; abs. in Zentbl. Physiol., 27 (1913), No. 19, p. 1036*).—The elementary components of the diet have different value, the author points out. For instance, in the case of common salt, more sodium than chlorin is retained, and in the case of protein, more sulphur than nitrogen.

In almost every case, there is a tendency to excrete phosphorus. Indeed, chlorin, phosphorus, and nitrogen are the food constituents which the body easily gives up as soon as the intake is sufficiently lowered. On the other hand, if the supply is lowered, sodium and sulphur are generally held on to and are excreted in diminished quantity.

The author states that general observations on different persons were supplemented by extended experiments, which led to the conclusion that losses of chlorin, phosphorus, and nitrogen have been observed to continue under certain conditions for months and years and that they are associated with the occurrence of nervous and other diseases. This leads to the conclusion that the daily diet does not meet man's ideal requirements when it is too poor in sulphur and alkalis or too rich in chlorin, phosphorus, and nitrogen.

Protein and nutrition, M. HINDHEDE (*London, 1913, pp. X+201, pls. 8*).—In this book the author summarizes the results of his own experiments with a low protein diet and also discusses the experiments carried out by other investigators regarding the protein requirement in nutrition. From the fact that the subjects of his experiments were able to maintain a good physical condition upon a low protein diet, the author believes that many of the common ills can be avoided and much better physical condition secured by a reduction of protein, and especially of meat, in the diet.

Experiments on the effects of a limited diet.—VI, The nutritive value of zein, gliadin, and egg albumin in experiments with white rats, S. BAGLIONI (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat., e Nat., 5. ser., 22 (1913), II, No. 12, pp. 721–728, fig. 1*).—From these experiments, carried on with laboratory animals, the author concludes that zein, gliadin, and egg albumin are not only capable of maintaining the nitrogen balance in the case of both adult and growing animals, but if given in sufficient quantity will allow a storing up of nitrogen in the body.

Animals maintained on a diet in which egg albumin was the sole source of protein showed a gain in weight. In the majority of cases those maintained on diets in which zein and gliadin were the sole sources of protein showed a loss of weight, both in the case of adult and growing animals. In the latter case the increase of weight could be restored by the addition of egg albumin or meat and bread to the diet.

Utilization of the proteins of cotton seed by man, J. B. RATHER (*Jour. Amer. Chem. Soc., 36 (1914), No. 3, pp. 584–586*).—An abstract of Bulletin 163 of the Texas Station, previously noted (E. S. R., 31, p. 65).

Influence of water on the digestion of solid substances, F. GROBBELS (*Hoppe-Seyler's Ztschr. Physiol. Chem., 89 (1914), No. 1–2, pp. 1–21, figs. 3*).—The experiments reported were made with laboratory animals (dogs).

According to the author, of the materials experimented with, water left the stomach soonest. Bread with water taken 5 minutes after required twice as long a time as water alone. However, the material remained in the stomach a shorter time than was the case with bread alone. The longest time was required for bread and water mixed. With water, the largest amount of liquid had left the stomach at the end of an hour, and with bread, the lowest amount, and the amount was greater when bread and water were taken in succession than when they were taken mixed.

The minimum amount of gastric secretion was noted with water and was only slightly lower for bread alone than in the other cases. When the dogs were made to thirst, an increase in the total amount of liquid which left the stomach in an hour was noted in one test without any special diminution of the gastric secretion or the length of the period of gastric digestion. In two other series both of these factors were diminished. Coffee, on the other hand, increased the period of gastric digestion without changing the percentage values.

The author, in discussing his experiments, notes that his work has a bearing upon the length of time that food remains in the stomach, but not upon the amount of work required of the secretory glands in digestion. He believes that his results support the common theory that dry food leaves the stomach less quickly than moist food, and that with respect to the time that food remains in the stomach, the best results are obtained when water or similar liquids are taken after food rather than when they are mixed with it, and that mixing solid or liquid foods is not desirable from a physiological standpoint.

In the case of taking bread or cake at the same time as coffee, he is of the opinion that the increase in the time the food is retained in the stomach is an advantage, since it prolongs the feeling of satiety and delays diuresis.

Influence of some inorganic salts on the action of the lipase of the pancreas, C. A. PEKELHARING (*K. Akad. Wetensch. Amsterdam, Proc. Sect. Sci., 15 (1912), pt. 1, pp. 336–347*).—From his experiments the author concludes that calcium, barium, magnesium, and sodium salts play a part with regard to the activity of lipase totally different from that of the bile acids. In his opinion one may conclude that these salts "separate fatty acid from the solution as soap, and for that reason increase the fat-splitting power of the enzym."

The rôle of caffein in the effects exercised by coffee on the heart, kidneys, and nervous system, H. BUSQUET and TIFFENEAU (*Bul. Soc. Sci. Hyg. Aliment., 3 (1913), No. 6, pp. 577–587, figs. 4*).—The results are reported of experiments carried out to determine the rôle of caffein in the cardiac, renal, and nervous effects of coffee.

These experiments and those carried out by other investigators show, in the opinion of the authors, that it is the caffein in the coffee which is responsible for the pharmaco-dynamic effects of coffee infusion. It is deduced from these conclusions that coffee which is sufficiently deprived of caffein may be considered as an almost negative substance. Caffein-free coffee may be substituted for ordinary coffee or not, according to whether one wishes to avoid or obtain the effects of caffein.

Physiological and pathological chymology, together with some experiments on chymotherapy, E. S. LONDON (*Physiologische und pathologische Chymologie. Nebst einigen Versuchen über Chymotherapie. Leipsic, 1913, pp. X+284; rev. in Zentbl. Biochem. u. Biophys., 16 (1914), No. 5–6, p. 180*).—This volume is not a systematic exposition of the phenomena of the stomach and digestive tract, but rather a useful summary of the investigations of the author and his pupils which have been published in recent years. Such a summary is convenient for those interested in the subject of digestion, not only because it brings material together but also because the reports contain the full data of the author's experimental methods. In his discussion of the results of the investigations the author presents simple, mathematical generalizations with respect to the power of secretion and digestion.

Metabolism and vitality, J. B. NICHOLS (*Med. Rec. [N. Y.], 85 (1914), No. 7, pp. 289–291*).—A digest of data regarding ventilation, humidity of the air, and similar topics, chiefly with reference to disease.

ANIMAL PRODUCTION.

Soiling crops to supplement Iowa pastures, H. H. KILDEE (*Iowa Sta. Circ. 12 (1913), pp. 4*).—This circular discusses the advantages of providing soiling crops for dairy cattle and gives instructions for the growing of soiling crops, such as oats and Canada field peas, fodder cane, cowpeas, millet, alfalfa, soy beans, etc., suitable to Iowa conditions.

It is stated that at the station an increased production from decreased acreage has been the result secured from this system of soiling crops. In 1911, 37 cows were kept on 19½ acres of pasture and the soiling crops from 8 acres. In 1912, 45 cows were kept on a 19½-acre pasture and 6 acres soiling crop, at a cost for each cow of $6.62.

The worth of cactus for feeding (*Cal. Cult., 42 (1914), No. 8, pp. 227, 242*).—This article is a compilation of reports of investigations and the opinions of various authorities on the feeding value of cactus and pie melons. Analyses show cactus to be of low feeding value, but as an appetizer fed with dry feeds it may prove of worth. The analyses indicate that spineless and spiney varieties contain about the same amount of nutriment.

Nitrogen assimilation in the feeding of sodium nitrate, E. GRAFE and H. WINTZ (*Hoppe-Seyler's Ztschr. Physiol. Chem., 86 (1913), No. 4, pp. 283–314*).—Experiments in the feeding of approximately 1 gm. per day of sodium nitrate to dogs and pigs indicate that there is a nitrogen retention in the body of from 10 to 15 per cent. Larger amounts had a toxic effect.

Nitrogen retention in the feeding of ammonium salts and urea, E. GRAFE (*Hoppe-Seyler's Ztschr. Physiol. Chem., 88 (1913), No 6, pp. 389–424*).—The

results of trials with swine fed ammonium salts and urea indicate that there is an increased nitrogen retention with these substances.

It is concluded that the form in which the nitrogen is retained must be as protein or protein-like substances.

Live stock and dairy produce (*Ann. Rcg. Agr. Expts.* [*London*], *1913, pp. 88–98*).—This is a résumé of British feeding experiments conducted during 1911–12 and previously reported from other sources.

[Austrian live stock statistics] (*Österr. Statis., n. ser., 5 (1910), No. 1, pp. 20+190, pls. 4*).—This is a compilation of statistics relating to cattle and live stock production in Austria for the decade 1901–1910, as prepared by the Royal Statistical Commission.

Heredity of unpigmented hair and of hide peculiarities in cattle and horses, A. R. WALTHER (*Ztschr. Induktive Abstam. u. Vererbungslehre, 10 (1913), No. 1–2, pp. 1–48, pl. 1, figs. 2*).—This reports studies made of the inheritance of color markings of Shorthorn cattle and of horses in the Trakehnen stud.

A bibliography of American and foreign works is appended.

Heredity of color in cattle, RICHARDSEN (*Deut. Landw. Tierzucht, 18 (1914), No. 6, pp. 61–65, figs. 10*).—A number of breeding trials indicated that the single coloring (reddish brown) of the Netherland breed of cattle dominates over the double coloring of the black and white sires. However, this dominance was incomplete as the white color markings were in evidence. The degree of coloring in the first cross was intermediate between the two parents. The color markings in year-old animals were less distinct than in the calves.

Estimating the age of calves, J. SCHWARZ (*Beiträge zur Altersbestimmung des Kalbes. Inaug. Diss., Univ. Leipsic, 1912, pp. 144, pls. 6*).—Observations were made on the growth of the eyeteeth, the retraction of the gums, the drying of the navel cord, and the occurrence of hoof rings to determine the age of calves.

Feeding of calves on skim milk and cassava porridge, A. GOUIN and P. ANDOUARD (*Bul. Soc. Nat. Agr. France, 74 (1914), No. 1, pp. 40–42*).—Successful trials are reported in feeding skim milk and cassava flour as a substitute for whole milk. Whole milk is fed the first week and the skim milk and cassava porridge thereafter.

Beef production, E. S. BAYARD (*Penn. Dept. Agr. Bul. 235, pp. 250, pls. 33*).—A somewhat complete popular treatise on the general phases of the feed, care, and management of beef cattle, embodying many feeding experiments previously reported from other sources, and including chapters on summer feeding, silage for fattening cattle, show steers, cattle farms, computing rations, cattle crops, slaughtering cattle on the farm, marketing cattle, and diseases of cattle.

The cattalo.—Crossing of American bison with domestic cattle (*Mark Lane Express, 111 (1914), No. 4301, p. 339*).—An account of Canadian trials in crossing the American bison with domestic cattle. The term cattalo is used to designate the mixed blood in all proportions including the hybrids. By using domestic bulls it was possible to get away from all resemblance to the buffalo, and vice versa by using the pure buffalo bull an animal was soon graded up indistinguishable from the pure buffalo.

The best results were obtained from a Hereford bull and a buffalo cow. Various other breeds, such as Angus, West Highland, Sussex, and Devon were tried, the object being to learn which sort would yield the choicest pelt, but no marked difference could be distinguished in the length and quality of hair on the hybrids. Where the Hereford was used, the white face characteristic dominated, but otherwise the whole color of the buffalo dominated.

It is stated that "experience seems to warrant the expectation that in later generations, after there has been time for selection, there may be seen on cattaloes having say 10 per cent or less of bison blood, as good fur as is now seen on the half and three-quarter buffaloes." There is also some prospect of improving the beef carcass by this hybridizing, for the bison carries an exceedingly high percentage of beef on the back, and the inheritance of this quality may be encouraged by selection. While there was some irregularity in the fertility of the hybrids it is believed that both males and females will be fairly fertile, and that complete fertility if not found at once will doubtless come through selection, as will early maturity.

Sex determination in sheep, compiled by P. B. POPENOE (*Jour. Heredity, 5 (1914), No. 2, pp. 46–57, figs. 4*).—Observations were made by A. G. Bell on his flock on Cape Breton Island during 1899–1901 on the effect of nourishment of the mother on the sex of offspring and on the production of twins. Earlier observations had led to the conclusion that "three conditions favorable to the production of twins revealed themselves: (1) Maturity in the ewes (ewes 4, 5, and 6 years old yielding a larger percentage of twins than younger or older ewes), (2) mating in October (with consequent lambing in March), and (3) a rapid increase of weight at the time of mating with subsequent loss of weight."

The results obtained in 1899 were inconclusive as to whether the extra feeding given the ewes in the fall had caused them to produce a larger percentage of twins than ordinary. However, it is noted that "no less than 72 per cent of the March-born lambs were females—a circumstance quite unprecedented in the history of the flock."

Believing that possibly climatic conditions were involved, an inquiry was made as to the flocks on the whole island of Cape Breton, the result of which showed that there had been a majority of males. The female percentage was therefore a local matter. Data were then collected as to the treatment during the preceding year of one flock which had produced 88.5 per cent males. Mating occurred at a time when the ewes were beginning to lose weight, after which they remained in reduced condition until their lambs were born. These results were in contrast to those obtained with the experimental flock and seemed to indicate that special feeding in the fall may have been responsible for the large proportion of females born in 1900. A study of the weight of the ewes shows that "at the beginning of October, before mating had been accomplished, the average weights of the two classes of ewes (male-bearing and female-bearing) were the same. The average male-bearing ewe increased in weight up to the end of October, after which there was a decline; the average female-bearing ewe, on the other hand, continued to gain in weight all through November so that by the end of that month the average female-bearing ewe outweighed the male-bearing—a superiority retained during the subsequent decline." Similar observations had been noted in earlier trials, 1890–1899.

It was further observed that the mothers of twins were above the average of the flock in weight and the mothers of single lambs were below the average. "Among the twin-bearing ewes there were none who had male lambs exclusively. Those which had male as well as female lambs were losing in weight at the time of mating and immediately after; whereas those which had female lambs alone were increasing in weight at the time of mating, and, though the weight dropped afterwards, did not continue to drop but remained substantially on a level for several weeks." It was found that the mothers of males were losing in weight at the time of mating, whereas the mothers of females retained their weight. From these observations it is concluded that "variations of weight occurring at or about the time of mating may have great significance.

They reflect changes in the condition of nutrition of the mother, at a critical period in the formation of the unborn young, and suggest the possibility of affecting the fertility of sheep and controlling the sex of their offspring by suitable feeding for a short period of time before and after the time of mating."

Feeling that the absolute number of ewes involved was too small to give certainty to the averages, further observations were made and a table prepared combining all the records. The weight of over 100 mothers of male lambs, taken in the autumn preceding birth of lambs was for September 30, 90.3 lbs.; October 31, 96.2; November 30, 95.6; and December 31, 94 lbs.; and for mothers of female lambs 91.2, 96.4, 95.2, and 94 lbs., respectively. Here it is shown that the average weights were practically the same and would evidently discountenance former conclusions. It is thought that this inconsistency may be accounted for by the fact that the male-bearing ewes increased in weight at a greater rate than the female-bearing ewes during the month of October. They started lower and reached the same point by the end of the month. A marked difference was found to exist between the weight curves for the two classes of ewes, twin-bearing and single-bearing. However, the author hesitates to draw a conclusion from these observations.

Annual report, 1912: Sheep division, A. G. MICHAELIAN (*Union So. Africa Dept. Agr. Rpt. 1912–13, pp. 71–135*).—A statistical report of the sheep and goat industry in the Union of South Africa.

Wool carding and combing, A. F. BARKER and E. PRIESTLEY (*New York, London, Toronto, and Melbourne, 1912, pp. XII+264, pls. 45, figs. 34*).—The chapters included in this book are on wool and hair-producing animals; sheep breeding and Mendelism; wools, hair, and the manufactured materials; commerce in wools and hairs; wool classing and sorting; the physical and chemical properties of wools, hairs, etc.; wool steeping, scouring, and drying; types of yarns generally considered; the preparation of long wools (English, cross-bred wools, and Merino wool for combing); and combing, recombing, and finishing.

A chemical study of the nutrition of swine, E. B. FORBES, F. M. BEEGLE, C. M. FRITZ, and J. E. MENSCHING (*Ohio Sta. Bul. 271 (1914), pp. 225–261, figs. 3*).—Five pigs from the same litter were used in a metabolism experiment involving eight 10-day periods, separated by 7-day intervals. The feeds used were corn alone in two periods; corn supplemented by soy beans, linseed-oil meal, wheat middlings, meat meal, and skim milk; and a ration of rice polish and wheat bran.

It was demonstrated that as sources of calcium for growing swine, corn, wheat middlings, linseed-oil meal, soy beans, wheat bran, and rice polish are unsatisfactory and will not maintain normal growth of bone. From 9 to 10 times as much calcium was retained from rations containing milk and meat meal as from the best one of the grain rations, which emphasizes the need of supplying those feeds rich in calcium, such as pasture and forage crops, especially the leguminous plants.

Corn was deficient in calcium, phosphorus, and nitrogen. Phosphorus was stored on all the rations but was insufficient for maximum growth in the ration of corn alone. In the ration of rice polish and wheat bran, which contained 12 times as much magnesium as calcium, the excess of magnesium appeared to cause a loss of calcium from the animal. Although the remaining rations contained an excess of acid over basic mineral elements, it did not affect calcium retention.

The ammonia of the urine was found to increase with the excess mineral acidity and the total protein of the ration.

One part of sodium chlorid to 256 parts of other feeds seemed to be more than sufficient for growing swine. It was found that the balances of sodium

and chlorin were largely controlled by the amount of water drunk. There was an extensive metabolism of sodium apart from chlorin. The feces may contain an abundance of sodium but are nearly free from chlorin.

Magnesium tends to deflect the phosphorus excretion from urine to feces, and excessive phosphorus content of the ration limits the absorption of magnesium. With an intake of 2.17 gm. of magnesium and 5.1 gm. of phosphorus there was a storage of magnesium, but with an intake of 9.28 gm. magnesium and 20.17 gm. phosphorus there was a loss of magnesium, combined with phosphorus, through the feces.

The potassium of these rations was more than sufficient in all cases. With the maximum intake, however, on the ration of wheat bran and rice polish, there was a loss of potassium, apparently through an excretion of previously stored excess. The urinary potassium varied inversely as the retention.

Nitrogen and sulphur balances were all positive. Sodium, potassium, sulphur, and chlorin were excreted in larger proportion in the urine than in the feces, while calcium, magnesium, and phosphorus left the body more largely in the feces.

The digestibility of the starch of corn was increased by the feeding with it of soy beans, tankage, and milk. Tankage and milk also increased the digestibility of the fat, and decreased the digestibility of the crude fiber of corn. Creatinin excretion in the urine was shown to be entirely independent of the feed, and to vary among the several individuals in the same order as live weight and weight dressed carcass, flesh, bone, and blood.

The metabolism crates used in the experiments are briefly described.

Pork that is made at home, P. F. TROWBRIDGE (*Country Gent., 79 (1914), No. 7, pp. 298, 299, figs. 14*).—An account of the slaughtering, cutting up, and curing of pork for home purposes.

Productive horse husbandry, C. W. GAY (*Philadelphia and London, 1914, pp. XV+331, pl. 1, figs. 173*).—This book is a comprehensive treatise on the structure and function of the horse, the types and breeds of horses, the principles of horse breeding, the feed, care, and management of the horse, stables, equitation, and markets and shows.

Weights and measurements of horses, H. W. WYNN (*Live Stock Jour. [London], 79 (1914), No. 2082, p. 199*).—There are given the average weights and measurements of 370 horses, representing the cavalry, mounted infantry, artillery, bus, light vanner, and hunter classes.

Origin of Argentina wild horses, W. D. MATTHEW (*Nature [London], 92 (1914), No. 2311, p. 661*).—The author presents evidence to show that the theory that the existing wild horses of South America are descended either wholly or partly from any surviving native stock is erroneous. He points out that the infertility of crosses between zebras or asses and domestic horses is based upon a separation dating back at least to the late Pliocene age, and since the species native to Argentina, if they continued to exist down to modern times, would have evolved in complete isolation from any northern species since the early Pleistocene, they should be equally infertile when crossed with the domestic stock. However, this is not the case. Assuming that the native horses may have survived in Argentina until the time of the Spanish settlement, the stock would not be able to interbreed with domestic stock and would remain separate and unmixed until exterminated.

The great producing brood-mare families, J. C. MCCOY (*Amer. Horse Breeder, 32 (1914), No. 9, p. 129, figs. 3*).—After commenting on the ancestry and attributes of several of our principal brood-mare families the author points out that to-day "our best results are coming from blending several crosses of the top of the Hambletonian family with several crosses of the great brood-

mare families. The more top crosses we get from both sides, the more certain it seems to be that the produce will be of high standard."

[International review of Percherons] (*Percheron Soc. Amer. Internat. Rev., 1 (1914), pp. 50, figs. 38*).—A review of the Percheron showing at the International Live Stock Show, 1913, together with photographic illustrations of the first and second prize winners in each class, and other data.

Farm poultry, C. C. WATSON (*New York and London, 1913, 11. ed., pp. X+369, figs. 104*).—This book, which is one of the Rural Science Series, is a complete treatise on breeds of poultry and the breeding, feed, care and management of poultry, ducks, geese, and turkeys.

Productive poultry husbandry, H. R. LEWIS (*Philadelphia and London, 1913, pp. XIX+536, pl. 1, figs. 217*).—A complete and practical treatise on the breeding, feed, care, and management of poultry, together with chapters on fattening, killing, and preparing for market.

New breeds of poultry (*Agr. Jour. Union So. Africa, 6 (1913), No. 5, pp. 826–828, figs. 3*).—An account of the Bustin Black Pretors breed of poultry which originated in an attempt to outbreed "liver disease" which is so prevalent among poultry in South America. There are two varieties, the single and the rose-combed. The former is a large bird, greenish black in appearance, with dark feet, black eyes, white ear lobes, red comb, upright carriage, and broad chested. From 178 to 200 eggs are laid per hen in 12 months, the eggs being large, round, and brown or tinted. The rose-comb variety was produced as the result of a freak, the outcome of a cross from the single-comb variety. Both breeds are said to be free from disease of a tubercular nature.

Some factors affecting the weight, composition, and hatchability of hen eggs, H. ATWOOD (*West Virginia Sta. Bul. 145 (1914), pp. 73–102*).—Earlier experiments (E. S. R., 23, p. 76) are cited showing that there is a relation between size of eggs and weight and thrift of chicks hatched from them, and that as previously shown (E. S. R., 13, p. 276) there appears to be a seasonal variation in the weight of eggs, the weight being greater from November to April and lightest from May to October.

During the season 1911–12, three lots of fowls were fed liberally and three lots scantily. While the former showed a fairly uniform increase in weight, the latter showed little, if any, increase. The lots fed liberally produced during the year 8,062 eggs while the scantily fed lots produced 5,144 eggs. The pullets of the liberally fed lots averaged 38.7 eggs each while the corresponding yearling hens produced an average of 125.6 eggs each. The heaviest eggs were laid during February, March, and April. During March the eggs of the liberally-fed lots averaged 60.3 gm. in weight while the scantily fed averaged 57.6 gm., indicating that quantity of feed slightly affects the size of eggs. The results of five hatches indicated that in general eggs from liberally-fed hens are more fertile than those from scantily-fed hens, but that the percentage hatch is practically the same among those eggs that are fertile. There appeared to be no great difference in the vigor of the chicks from the two lots of fowls.

Duplicate experiments conducted during 1912–13 gave results similar to those of 1911–12. It was noted that the average weight of eggs from the fowls of the first year of test was 57.5 gm. and of the second year 58.92 gm. or 1.4 gm. increase, apparently due to increased age of the fowls. Likewise eggs from yearling hens showed greater weight than those from pullets. Further hatching tests showed practically no difference in the average fertility or hatchability of the eggs from the fowls fed heavily or scantily. There was considerable variation, however, in the results from the different pens, due, probably in large measure, to variations in the vigor of the males. Mortality tests were inconclusive.

Analyses made to determine the seasonal variation in the composition of eggs showed that the average percentage of the total egg that is dry yolk was 13.85 in October and 15.56 in April; that the phosphoric acid in the dry yolk was 2.607 in October and 2.653 per cent in April; and that the percentage of dry white in the total egg was 8.395 in October and 7.39 in April. However, it is believed that the analyses were too few to justify definite conclusions. The indications are that during the spring when hens are laying well and when the eggs are heavier than at any other time of the year the dry matter of the yolk constitutes a greater percentage of the total weight of the egg than in the fall when the fowls are laying less liberally. This fact presumably accounts for the larger and more perfectly nourished chicks in the spring than in the fall.

In comparing two lots of pullets, one fed on granulated bone in addition to the regular grain mixture, and the other oyster shell, it was found that the former lot laid practically twice as many eggs. The yolks of lot 1 constituted a larger proportion of the total egg substance than did those of lot 2, indicating that a lack of sufficient phosphorus in the ration results in diminished size of yolk. There was also slightly more phosphorus in the dry matter itself when the fowls received abundant phosphorus supply in the ration. The whites of the eggs of lot 2 constituted a greater percentage of the total weight of the egg than did those of lot 1, but the percentage of phosphorus in the whites was identical in both cases. The shells of the eggs laid by fowls fed granulated bone were somewhat heavier in proportion to the total weight of the eggs than the shells of eggs from oyster shell-fed fowls, and contained 6.66 per cent more phosphoric acid, indicating that some of the tricalcium phosphate of the granulated bone was used for shell material. It is not known whether this phosphorus can be assimilated by the developing embryo as is done in the case of calcium carbonate. It was found that the ordinary grain ration fed to laying hens contains several times as much phosphorus as is found in the eggs produced.

Rearing chicks successfully, R. M. Sherwood (*Iowa Sta. Circ. 17 (1914), pp. 5–15, figs. 6*).—In this circular general instructions are given for the rearing of chicks, including natural and artificial brooding, feeds and methods of feeding, and sanitary precautions.

[Turkeys], Margaret Mahaney (*Boston, 1913, pp. XIII+132, pls. 12*).—A general treatise on the breeding, care, feeding, management, and diseases of turkeys.

On a case of unilateral development of secondary male characters in a pheasant, with remarks on the influence of hormones in the production of secondary sex characters, C. J. Bond (*Jour. Genetics, 3 (1914), No. 3, pp. 204–216, pls. 5*).—In the case under observation, on careful dissection no trace of a sex gland could be found on the right side. The sex gland on the other side is described as an ovotestis, which probably functioned originally as a female gland. The ovarian portion subsequently atrophied while the tubular gland or male portion became functionally active. Male secondary characters developed on one side of the body only and the hormonic explanation is given as a partial although not a complete solution of the problem.

It is shown that the "presence of male sex gland elements is necessary for the development of secondary male characteristics in every individual whether the female sex gland be present or not, [and that] the essential point is the presence of a stimulating factor rather than the absence of an inhibiting factor." In this particular case "not only are the somatic characters different on the two sides but the sex gland is also a dual gland composed of male and female elements. The bird is in fact a true genetic as well as a somatic hermaphrodite."

In accounting for this abnormal case it is assumed that "the fertilized egg from which this zygote developed was a female egg, i. e., heterozygous in respect of sex, [and that] at the stage of blastomeric segmentation at which the division of the body into two halves was laid down, the sex factor (instead of passing in equal portions to each half of the germ) divided unevenly, the factor for maleness passing into the left half and the factor for femaleness into the right half of the body."

Studies of inheritance and evolution in Orthoptera, I, R. K. NABOURS (*Jour. Genetics, 3 (1914), No. 3, pp. 141–170, pl. 1, figs. 3*).—After a study of more than 5,000 recorded individuals resulting from the crossing of species, the inbreeding and crossing of hybrids, and the crossing of hybrids with species, it is concluded that "the inheritance behavior of the color patterns in these orthopterous insects shows clearly the Mendelian type of inheritance, and the essential result of these experiments has been the extension of this principle to a considerable number of types of a phylogenetically low group of ametabolous insects."

Peat-moss litter; some of its uses; its manufacture and its future on this continent, W. F. TODD (*Jour. Amer. Peat Soc., 6 (1913), No. 4, pp. 161–166*).—This article treats of the advantages accruing from the use of peat moss as a litter.

It is stated that the moss must be in a finely powdered state to give the best results. Among the advantages claimed for the moss are its disinfecting and deodorizing properties, and its absorbing powers for all liquids and gases. It is also claimed that it keeps away flies, is dustless, free from danger of fire, is from 2 to 3° warmer in winter than straw bedding, is conducive to a healthy growth of the hoof, and adds to the value of the manure. It is claimed that 1 ton of good peat moss will last as long as 2½ tons of straw and that in a box stall one bedding properly handled can be made to last three months. Although but 8,000 tons of peat moss is used annually in this country, Great Britain uses 180,000 tons.

DAIRY FARMING—DAIRYING.

Care, feed, and management of the dairy herd, H. H. KILDEE (*Iowa Sta. Circ. 16 (1914), pp. 3–39, pl. 1, figs. 9*).—The subjects discussed in this circular are the general advantages of dairy farming, the selection of cows and bulls, feeding stuffs, and soiling crops, preparing the cow for her year's work, encouraging persistency of large milk flow, influencing butter-fat production, rearing the calves, feed and care required by dairy heifers, feed and care of the dairy bull, herd records, essentials in dairy buildings, and diseases common in the dairy herd.

The effect of pituitary extract on the secretion of milk, J. HAMMOND (*Quart. Jour. Expt. Physiol., 6 (1913), No. 1, pp. 311–338, figs. 2*).—From the results of these studies it is concluded that the "injection of pituitary extract has an immediate action on milk secretion, but the effect soon passes off. During the period after injection there is a rather rapid decrease in the milk flow, but this decrease is gradual and there is no sudden drop followed by increasing secretion to normal. This indicates that the effect of the extract is not muscular. The daily yield is only slightly increased as a result of injection. This shows that the extract acts rather by setting free than by causing the formation of the milk constituents.

"From the composition of the milk obtained as a result of injection, together with other facts, it is concluded that the action of the pituitary extract is not effected through rise of blood pressure. The amount of milk secreted as

a result of injection depends on the period of lactation and also on the state of nutrition. This together with other considerations supports the view that it is not variations in the conditions of the pituitary gland which give rise to the cycle of changes which occur in the mammary gland. Histological evidence points to a direct action of the extract on the glandular epithelium. The flattened appearance of the cells of the full alveolus is caused by the expansion which they have to undergo when the lumen becomes filled with milk.

"The milk obtained as a result of injection is normal in composition except for a higher percentage of fat; in the following milkings, however, there is a drop in the percentage of fat although that of the other constituents remains normal. While the solids-not-fat (proteins, lactose, and ash) are secreted in close connection with the water of the milk, the amount of fat secreted is in no wise connected with the amount of water. The ratio 'nitrogen to lactose' is relatively constant throughout. These facts suggest the theory that the pituitary extract causes the combination of the precursor of milk protein and lactose (possibly a glycoprotein) with water and salts of the blood, and so by a purely secretory action produces this part of the milk. The suddenly altered tensions so set up in the epithelial cells cause the fat globules which have accumulated at the ends of the cells to be discharged and to produce milk which is rich in fat. It is because of the relatively large amount of the pituitary extract injected and because of the suddenness of the change that the fat percentage goes up. The act of milking, which also causes rapidly altered tensions, has the same effect.

"Although there is considerable variation, yet the average results on varying the dose of pituitary extract injected show that the smaller doses give less milk with a lower percentage of fat. When the doses are relatively large it does not matter how much is injected, for only a certain amount of milk can be obtained. There is some indication that a goat in the early stages of lactation is more sensitive to small doses than one in a later stage. Experiments with fractional milkings show that while the percentage of fat rises from start to finish in normal milk, yet in milk obtained as a result of injection the percentage remains constant throughout."

Carotin, the principal natural yellow pigment of milk fat: Its relations to plant carotin and the carotin of the body fat, corpus luteum, and blood serum, L. S. PALMER and C. H. ECKLES (*Jour. Biol. Chem., 17 (1914), No. 2, pp. 191–249, fig. 1*).—This work comprises 5 papers.

I. *The chemical and physiological relation of the pigments of milk fat to the carotin and xanthophylls of green plants* (pp. 191–210).—The object of the investigation here reported was to classify the milk-fat pigment, not only as a true lipochrome, but also with respect to its relation to the carotin and xanthophylls of green plants, and to determine the relative influence of certain factors, such as character of ration and breed of cow, upon the color of the butter. It was observed that "the fat of cow's milk owes its natural yellow color to the pigments carotin and xanthophylls, principally carotin, the well-known, widespread, yellow vegetable pigments found accompanying chlorophyll in all green plants. The carotin and xanthophylls of milk fat are not synthesized in the cow's body, but are merely taken up from the feed and subsequently secreted in the milk fat.

"When feed practically free from carotin and xanthophylls, such as the cow usually receives during the winter months, is given to a milk-giving cow, the immediate supply of these pigments in the organism is greatly depleted and may be entirely used up, on account of the constant drain upon the supply by the milk glands. The butter fat accordingly approaches a colorless condition in proportion to the supply of carotin and xanthophylls in the system, the length of

time these pigments are kept out of the feed, and also very probably in proportion to the amount of milk fat being produced.

"If feed rich in carotin and xanthophylls is given to a milk-giving cow whose milk fat has become practically colorless by reason of the above conditions, the organism will at once recover its lost pigments and the milk fat will increase in color in proportion to the amount of carotin and xanthophylls, especially carotin, in the feed. Fresh green grass probably being the richest in carotin of all natural dairy cattle feeds, accordingly produces the highest colored butter.

"There is some difference among the different breeds of dairy cows in respect to the maximum color of the milk fat under equally favorable conditions for the production of a high color. Each breed of cows, however, will undergo the same variation in color of the milk fat which follows a withdrawal or addition of carotin and xanthophylls, especially carotin, to the feed. Under some conditions, also, the apparent breed characteristic largely disappears. The popular opinion in regard to the breed characteristic has been overemphasized, and statements in regard to it should in the future be qualified with a statement of the conditions of the feed, etc. Under normal conditions cows of all breeds produce very high colored milk fat for a short time after parturition. The pigments of the fat at this time are identical with the normal pigments of the fat. Their increase at this time is probably due to the physiological conditions surrounding the secretion of the milk of the freshening animal."

II. *The pigments of the body fat, corpus luteum, and skin secretions of the cow* (pp. 211–221).—In these studies it was found that "the yellow lipochrome of the body fat, corpus luteum, and skin secretions of the cow, like the lipochrome of butter fat, is composed principally of carotin, which sometimes has associated with it one or more minor xanthophyll constituents. The carotin and xanthophyll pigments of the body fat are derived from the feed of the cow. The body fat of Jersey cows formed on a ration deficient in carotin and xanthophylls is devoid of color.

"The body fat of Jersey and Guernsey cows is usually characterized by a higher yellow color than the body fat of other breeds. This is of great importance in explaining why Jersey and Guernsey cows sometimes show a much slower elimination of pigment from the milk fat on a nonpigmented ration, as during the winter months. In these cases the body fat furnishes a supplementary source of carotin and xanthophylls for the milk fat. The yellow body fat of the Jersey and Guernsey cows should not be a point against the use of these animals for beef. The pigments here are the same as those for which the consumer will pay a higher price when present in butter.

"The breeders of Jersey and Guernsey cattle are no doubt correct in their belief that the yellow skin and skin secretions of these animals are characteristic of these breeds. It is not correct, however, that this characteristic is indicative of the ability of the breeds to secrete yellow milk fat under all conditions. The only indication of this is whether the feed contains an abundance of carotin and xanthophylls. The blood serum of the new-born Jersey calf is free from carotin and xanthophylls. The small amount of fat on the body is tinted faintly with these pigments."

III. *The yellow lipochrome of blood serum* (pp. 223–236).—"The well-known lipochrome of the blood serum of the cow is, like the lipochrome of the milk fat, body fat, etc., of the same animal, composed principally of carotin, the widespread hydrocarbon pigment of plants. Associated in small quantity with the carotin of the serum, probably dissolved in the fat of the blood, are one or more xanthophyll pigments which are always found in more or less variable quantity associated with the carotin of plants. The carotin and xanthophylls

of the blood serum are derived from the feed and furnish the normal source for these pigments in the milk fat and body fat, etc. A variation in the quantity of these pigments in the feed results in a corresponding variation in the amount found in the blood serum and milk fat. Body fat formed during this time will also be affected.

"The carotin is carried by the blood serum in combination with an albumin. The combination is a very firm one. Lecithin and cholesterol are probably a part of the combination. We propose the name caroto-albumin for the new chromo-protein of the blood. The caroto-albumin of the blood serum of the cow is probably of importance in the formation of milk fat, body fat, and the corpus luteum of the cow. It is doubtful if this new pigmented protein is of importance in the oxygen respiration of the body. The lactalbumin of cow's milk may, among other factors, be related to the color of the milk fat. There appears to be a special relation here in connection with the high color and high albumin content of colostrum milk."

IV. *The fate of carotin and xanthophylls during digestion* (pp. 237–243).—"Carotin is assimilated from the feed of the cow in preference to xanthophylls partly because of its greater stability toward the juices of the digestive tract. Xanthophylls are much more soluble in bile than carotin, which probably accounts for their appearance in the fat of the blood.

"It is probable that carotin forms by far the greater part of the lipochromes of the cow's body chiefly on account of its ability to form a compound with one of the proteins of the blood. The xanthophylls, being of a different composition, probably are not capable of forming such a compound."

V. *The pigments of human milk fat* (pp. 245–249).—"The fat of human milk may be tinted by carotin and xanthophylls, the pigments which characterize the fat of cow's milk. The relative proportions of carotin to xanthophyll in human milk fat is much more nearly equal than in the fat of cow's milk. The colostrum fat of human milk is characterized by a very high color, as is the case with the fat of the colostrum milk of cows. The pigment of human body fat is no doubt identical with the pigment of human milk fat."

Improvement of the milk supply (*Ann. Rpt. N. Y. Milk Com., 7 (1913), pp. 7–34, pls. 8*).—Part 1 of this report relates to the character and scope of the work of improving the city milk supply; the standards prescribed by the commission and indorsed by the milk dealers; bacterial standards; the resolutions as adopted by the conference of the delegates appointed by the governors of the Eastern and Middle States, called by the New York Milk Committee, to consider the improvement of state laws for the control of milk industry and for the suppression of bovine tuberculosis; investigations conducted on the icing of milk in transit; short-measure milk bottles; transfer of milk on street; milk served at school lunches; hospital milk supply; typhoid and septic sore throat epidemics; and the findings of the conference to consider the fixing of the market price of milk.

Pasteurization in bottles and the process of bottling hot pasteurized milk, S. H. Ayers and W. T. Johnson, jr. (*Jour. Infect. Diseases, 14 (1914), No. 2, pp. 217–241, figs. 6*).—The general object of this investigation was to compare on a laboratory scale pasteurization in bottles with the process of bottling hot pasteurized milk.

It was found that pasteurization in the bottle at a temperature of 145° F. for 30 minutes causes satisfactory bacterial reductions, but that bottles should be steamed for at least 2 minutes before being filled with milk. When milk at an initial temperature of 50° is heated in bottles without agitation in water at about 146°, the temperature of the milk in the top of the bottle will reach 140°

in about 9 minutes before that in the bottom. Bottles with chipped or otherwise imperfect tops should not be used, since the seal caps may allow leaks during the process of pasteurizing.

The advantages claimed for pasteurizing in bottles are that the danger of recontamination is lessened and there is a saving in milk losses due to handling and evaporation over coolers. However, greater expense is incurred through the necessity of water-tight caps. The process of bottling pasteurized milk while hot into hot steamed bottles causes equally good bacterial reductions as does pasteurization in bottles and eliminates bottle infection. It was demonstrated that milk may be pasteurized, bottled hot, capped with ordinary cardboard caps, and cooled by a blast of cold air.

It is thought that "if milk is cooled from 145 to 50° within 5 hours no more bacterial increase will take place during the slow cooling than would take place if the milk were cooled immediately to 50°. Whether or not this will be true under commercial conditions can be determined only by future experiments. As far as laboratory experiments indicate, when milk is heated to 145° for 30 minutes, bottling hot pasteurized milk followed by slow gradual cooling has no more appreciable effect on the cream line or flavor of milk than does the ordinary process of pasteurization. This is true for cooling periods of less than 5 hours' duration.

"Since milk contracts on cooling, a quart bottle filled with milk at 145° does not hold a full quart when the milk is cooled to 50°. It is about 0.62 of an ounce short. Therefore slightly oversized bottles should be used.

"The advantages of the process are: (1) That bottle infection can be eliminated, (2) that milk losses are saved, owing to evaporation over the cooler, and (3) that ordinary cardboard caps can be used. The principal disadvantage is that the air-cooling process requires several hours. This, however, would be a disadvantage only in the few plants where milk is delievered directly after pasteurization."

It is concluded from these investigations that the process of bottling hot pasteurized milk followed by air-blast cooling is an entirely feasible modificaton of the "holder" system of pasteurization. It is proposed to conduct further experiments to test the efficiency of this method on a commercial scale.

The Lobeck biorisator. NEVERMANN (*Berlin. Tierärztl. Wchnschr., 29 (1913), No. 48, pp. 862–864*).—A description of a recently invented apparatus for heating milk for which is claimed the quality of killing all micro-organisms, including intestinal catarrh of children, cholera, typhus, and tubercle bacilli without destroying the flavor or nutritive value of the product.

The milk is subjected to pressure in a chamber, from whence it is conveyed to a large cylindrical vessel, which it enters in the form of a fine spray and is at the same time subjected to a temperature of 167° F. From the cylinder it passes through a cooler where its temperature is rapidly lowered to at least 50°. The milk is therefore subjected for only a short time to the sterilizing temperature and while in the form of a spray. An advantage of this method is that no milk is lost by evaporation.

Johnson's standardizing computer. C. A. JOHNSON (*Norway, Mich., 1913, pp. [44]*).—A book of practical standardizing tables for creameries, ice cream factories, diarymen, city milk supply concerns, etc.

VETERINARY MEDICINE.

Results of research in the general pathology and pathologic anatomy of man and animals, edited by O. LUBARSCH and R. VON OSTERTAG (*Ergeb. Allg. Path. Mensch. u. Tiere, 16 (1912), pt. 2, pp. VII+845*).—The first part of this

annual has been previously noted (E. S. R., 28, p. 178). The contents of the present volume are as follows: Pathology of Cancer, by G. Herxheimer and F. Reinke (pp. 1–343); Regeneration, Transplantation, and Parabiosis, by M. Goldzieher and E. Makai (pp. 344–759); and the Histological Detection and Biochemical Significance of Oxidizing and Reducing Substances Within the Cell, by W. Loele (pp. 760–806).

A large bibliography accompanies each topic.

Studies from the Rockefeller Institute for Medical Research (*Studies Rockefeller Inst. Med. Research, 18 (1914), pp. VII+596, pls. 77, figs. 22*).—This is a collection in one volume of the studies which have appeared from time to time in the literature from the departments of pathology and bacteriology, physiology and pharmacology, chemistry, experimental surgery, experimental biology, and the hospital of the Rockefeller Institute.

The Lister Institute of Preventive Medicine (*Lister Inst. Prev. Med., Collected Papers, No. 9, pt. 2 (1912–14), pp. [VI+540], pls. 20, figs. 34*).—This is a collection of reprints of articles on physiology, zoology, and biochemistry published in various scientific journals.

Blood sugar, I. Bang (*Der Blutzucker. Wiesbaden, 1913, pp. VIII+162, figs. 13*).—This exceptional volume deals with the physiological sugar content of the blood of man, bovine, horse, sheep, goat, pig, rabbit, cat, and other animals, the reducing substances in blood and their distribution, physiological variation of the sugar content of the blood, experimental hyperglycemia and hypoglycemia, the origin of sugar in the blood, and historical facts relating thereto.

Anaphylaxis, C. Richet, trans. by J. M. Bligh (*Liverpool and London, 1913, pp. XII+266*).—An English translation of this work. Among the topics discussed are the history of anaphylactic phenomena, duration and symptoms of anaphylaxis, anaphylactizing substances, passive anaphylaxis, anaphylaxis in vitro, the relation of anaphylaxis to the precipitin and the complement deviation reactions, antianaphylaxis, anaphylaxis in medicine, and local, chronic, alimentary, and general anaphylaxis.

Studies on the complementary and antihemolytic properties of normal sheep serum, F. M. Surface and G. C. Routt (*Jour. Med. Research, 28 (1913), No. 3, pp. 441–463*).—"Fresh normal sheep serum contains a complement capable of dissolving sensitized sheep corpuscles. Sheep serum is relatively poor in hemolytic complement. It rapidly loses its complement ability upon standing. Fresh normal sheep serum is able to prevent the action of guinea pig complement. In the fresh serum this inhibiting property is partially masked by the native complement in the sheep serum. If the sheep serum is heated just sufficiently to destroy its complement the inhibiting property remains and can be clearly demonstrated.

"Heating the sheep serum to temperatures below 52° C. increases its inhibiting properties. Heating at temperatures higher than this tends to destroy this property. If the serum is heated to 60° or beyond, both its complement and its antihemolytic property are destroyed. There is an apparent auxilytic action of the guinea pig complement upon the complement of the sheep serum. This inhibiting property of sheep serum is not due to complement fixation by antibodies in the hemolytic rabbit serum. It is probably not due to any precipitate which may be formed by the mixture of guinea pig and sheep serum.

"The evidence indicates that there is a true anticomplement (against guinea pig complement) in fresh normal sheep serum. This is present in relatively small amounts, and most of its action is masked by the sheep complement. If the complement is removed from the sheep serum the anticomplement becomes manifest. The anticomplement is destroyed by heating at 60° and higher.

Defensive ferments of the animal organism, E. ABDERHALDEN (*Abwehrfermente des tierischen Organismus. Berlin, 1913, 3. ed., rev. and enl., pp. XV+229, pl. 1, figs. 11*).—This is the third revised and amplified edition of this work (E. S. R., 30, p. 77) in regard to the ferments which appear in the body and blood plasma as the result of injecting substances foreign to the organism. The diagnostic significance of these factors is discussed in minute detail and the practical application of these principles for the serodiagnosis of pregnancy and infectious diseases is described. The apparatus used for these purposes is pictured.

Protective (defensive) ferments and the serodiagnosis of pregnancy, L. W. FETZER (*Amer. Jour. Vet. Med., 9 (1914), Nos. 2, pp. 79, 80, 96, 122; 3, pp. 149, 150, 203, 204, fig. 1; 4, pp. 248–250*).—This gives an account of the principles underlying the elaboration of the protective ferments in the body (see above), with a detailed description of the technique necessary for conducting the Abderhalden test for diagnosing pregnancy in man and animals. The apparatus necessary is illustrated and criterions for judging the results of the reaction are included.

Preliminary communication on a complement deviation reaction exhibited in pregnancy, G. H. S. CLOWES, F. C. GOLDSBOROUGH, and F. WEST (*Abs. in Proc. Soc. Expt. Biol. and Med., 10 (1913), No. 3, pp. 107, 108*).—Both heated and unheated sera of 25 normal pregnant women in which lues could be excluded were examined, also the blood of the infants taken from the umbilical cord at the time of birth.

The unheated sera invariably contained antibodies capable of causing a well-marked deviation of complement when used in conjunction with an antigen obtained by extracting human blood clots with alcohol. The unheated infants' sera tested under the same conditions gave negative results. Other tissues (antigens) gave a less marked reaction with the unheated mothers' sera and no reaction with the infants' sera.

"The deviation body concerned in this reaction is destroyed by heating for one-half hour at 58° C. The mothers' sera tested after heating were negative to the antigens enumerated above, and those of the infants either negative or very slightly positive, but exhibiting on the whole a somewhat greater capacity to deviate than that possessed by the heated mothers' sera. The deviating capacity of unheated mothers' sera varies greatly, certain cases exhibiting a complete deviation only when employed in concentrations as high as 0.05 to 0.075 cc. of serum, others giving a complete deviation when amounts as small as 0.001 cc. of serum were employed. . . .

"Similar nonspecific immune bodies destroyed by heating at 58° have been observed in cancer and other pathological conditions, and to a certain extent in supposedly normal individuals. The entire absence of these bodies in the blood of newborn infants and their invariable occurrence in the blood of pregnant women at term indicates that in this case at least they probably bear some relation to the reaction of the body against detached fetal cells or proteid or enzymatic bodies of fetal origin. The occurrence of this reaction to a marked extent in cancer, particularly in those cases in which tumors are absorbing under treatment, lends further support to this point of view."

On the antitryptic reaction exhibited in pregnancy, G. H. A. CLOWES and F. C. GOLDSBOROUGH (*Abs. in Proc. Soc. Expt. Biol. and Med., 10 (1913), No. 3, p. 109*).—The antitryptic index was determined in the sera of 25 pregnant women and their infants. "The antitryptic index of the mother's serum was found to range from 1.5 to 2.5, averaging about 2, while that of the infants was found to range from 0.9 to 1.2, averaging slightly over 1. The antitryptic index of a series of cancer cases previously reported shows a range of varia-

tion from 1.2 to 3.5 and gives an average over 2. It will thus be seen that the blood of this series of 25 infants appears to be practically normal. On the other hand, the blood of the mothers contains an extremely high percentage of antibodies to trypsin, averaging over twice the normal, a characteristic also exhibited by cancer blood."

The antitryptic reaction is destroyed by heating the serum for one-half hour at 60° C. and in this respect it resembles the complement fixation as noted in the abstract above. These two reactions may have a common origin.

Abderhalden's biological test of pregnancy. P. F. Williams and R. M. Pearce (*Abs. in Proc. Soc. Expt. Biol. and Med., 10 (1913), No. 3, p. 73*).—"The use of Abderhalden's test for pregnancy [E. S. R., 28, p. 777], employing the dialysis method and the ninhydrin color reaction, has given positive results with each of 28 sera from pregnant women and with 8 from women in the post partum period, including one abortion. The test has never been negative in a known pregnancy. On the other hand, the serum of pregnancy reacts with tissues (kidney, heart, uterus) other than placenta. Also sera of two cases of nephritis, one of tabes and one of infection (carbuncle), and occasionally of some individuals in apparent perfect health, have given the reaction with placenta and other tissues."

The ninhydrin reaction was superior to the biuret test and the small dialysis thimbles (S. & S.) are preferred to the fish-skin membranes originally recommended. Results as satisfactory as those obtained by dialysis are obtained by mixing tissues and serum in tubes, incubating for 24 hours, and testing the filtrate obtained after treatment by heat and acetic acid with ninhydrin.

"As the result of the studies [the authors] feel that this test can not be accepted as an accurate clinical method until it has been more thoroughly investigated and the possible sources of error corrected. This conclusion, however, applies only to Abderhalden's dialysis method and not to his optical method, with which [the authors] have had no experience."

Diagnosis of pregnancy according to Rosenthal. H. Scholz (*Berlin. Tierärztl. Wchnschr., 29 (1913), No. 48, pp. 858, 859*).—A description of a method which determines the antitryptic index of the serum of the patient with a solution of trypsin and casein. The principle upon which the method is based is Fuld's.

Bactericidal action and chemical constitution with special reference to basic benzol derivatives. C. H. Browning and W. Gilmour (*Abs. in Jour. Path. and Bact., 18 (1913), No. 1, pp. 144–146*).—In this investigation certain general principles were established, namely "(1) *Staphylococcus aureus* and *Bacillus anthracis* are more susceptible to the action of basic benzol derivatives than are organisms of the coli-typhoid group. This result has been obtained with triphenylmethan derivatives (triamido-triphenylmethan compounds—parafuchsin, fuchsin, hexamethyl and hexaethyl violet, methyl green; diamido-triphenylmethan compounds—Döbner's violet, malachite green, brilliant green, glacier blue, setoglaucin, setosyanin; naphthalin compounds—victoria blue, new victoria blue, night blue), acridin compounds (3.6 diaminoacridin, acridin yellow, and other diaminoacridin derivatives containing CH_3 groups substituted either in the benzol rings or in the amino groups), indamins (Bindschedler's green), azin dyes (toluylene red, safranin), the thinazin group (methylene blue, new methylene blue), thiopyronin; also with tetrachlor-ortho-biphenol, tetrabrom-α-kresol. (2) It is not possible to differentiate generally the Gram-positive organisms as susceptible to hexamethyl violet and the Gram-negative group as insusceptible; thus *Vibrio choleræ, B. choleræ gallinarum, B. B. fœcalis alcaligenes* were found to be all comparatively nonresistant to this dye. (3) Salts

of the heavy metals do not act less powerfully on the coli-typhoid group than on *S. aureus* and *B. anthracis*, e. g., mercury perchlorid, silver nitrate, gold chlorid."

Ehrlich and Bechhold have previously pointed out that the action of powerful antiseptics such as mercuric chlorid and tetrachlor-ortho-biphenol was greatly diminished by the presence of serum. In these tests it is shown that sheep's serum heated at 57° C. and unheated serum diminished the antiseptic action for the *S. aureus* only slightly in the case of hexamethyl violet and to a greater degree with brilliant green, while the depression was very marked with tetrachlor-ortho-biphenol. The antiseptic action of diaminoacridin increased for the *S. aureus*, *B. anthracis*, *B. coli*, and *B. typhosus* when serum was present.

The volatile nature of the toxic constituent of poison ivy, C. E. BESSEY (*Amer. Jour. Pharm., 86 (1914), No. 3, pp. 112–114*).—An account of the personal experiences of the author, who became poisoned by simply looking at the flowers and foliage of poison ivy contained in a box some distance away.

While the author does not deny Pfaff's statement that ivy contains a fixed poison, he emphasizes the fact that a volatile poison must be present also.

Some observations on the pollen of poison sumac, L. E. WARREN (*Amer. Jour. Pharm., 85 (1913), No. 12, pp. 545–549*).—The alcoholic extract made from from the pollen of sumac (*Rhus vernix*) when tested physiologically upon 4 human subjects according to Tschirch and Stevens's method showed no toxic properties. "The evidence that Rhus poisoning may be wind-borne is materially weakened by the results, and the theory that poisoning can take place only by contact with the plant receives additional support."

The cause of fagopyrism and some notes on the fluorescent coloring matters in the hulls of buckwheat seeds, K. FESSLER (*Hoppe-Seyler's Ztschr. Physiol. Chem., 85 (1913), No. 1–2, pp. 148–155; Berlin. Tierärztl. Wchnschr., 29 (1913), No. 28, pp. 497–499*).—Buckwheat, when fed to animals, especially those with unpigmented skins, is often toxic when the animals are exposed to sunlight. Researches by Fischer and others led to the detection of a fluorescent substance which was noted to a large extent in the hulls of buckwheat.

In this investigation the solvents used were alcohol (95 per cent), acetone, ether, chloroform, benzin, and carbon disulphid. The color of the solution obtained varied from a light to a dark green and from a brown red to a red fluorescence. Benzin was colored only slightly and the color of the carbon disulphid solution was olive to light brown and showed no fluorescence. On long standing the color of the solution was changed and the fluorescence lost. Alcoholic solutions became brownish green and ethereal solutions yellow green. Drying also destroys the fluorescence. The green coloring matter was identified as crude chlorophyll; the yellow coloring matter was considered a xanthophyll.

The crude chlorophyll extract contained a brown coloring matter to which the seeds owe their yellow color and which probably belongs to the phlobaphenes of the pyrocatechin group. It is without pathological significance.

Other substances noted were pentoses, mucin, and phytosterol.

As the green coloring matter is strongly photodynamic and as Hausmann has ascribed to it toxic properties, it might be of interest to study the pharmacological action of the various components of the crude chlorophyll extract.

The pathology of growth: Tumors, C. P. WHITE (*London, 1913, pp. XII+235, figs. 89*).—This book deals with the subject under the following headings: Variations in development, growth, and functional activity; regeneration, transplantation, etc.; tumors—introduction; organomata; histiomata; cytomata; the general morphology and relationships of tumors; the origin of

tumors; the growth and life history of tumors; the physiological aspects of tumor growth; the biological aspects of tumor formation; and the causation of tumors.

Biological detection of parasites, I. BARIT (*Über den biologischen Nachweis von Parasiten. Inaug. Diss., Univ. Königsberg, 1912, pp. 31; abs. in Zentbl. Biochem. u. Biophys., 14 (1912), No. 3–4, p. 150*).—No specific complement fixation reaction could be obtained with tapeworm extracts. This is contrary to the findings of Meyer (E. S. R., 28, p. 880).

Further note on the growth of filarial embryos in vitro, F. M. JOHNS and P. L. QUERENS (*Amer. Jour. Trop. Diseases and Prev. Med., 1 (1914), No. 9, pp. 620–624, pl. 1*).—In dextrose defibrinated blood from the dog, prepared and inoculated at a temperature of 37° C., the embryos of *Filaria immitis* exhibit growth and motility for a period of about 15 days, when the media and organisms begin to disintegrate.

Investigations on precipitating anthrax serum, W. PFEILER and L. DRESCHER (*Mitt. Kaiser Wilhelms Inst. Landw. Bromberg, 5 (1913), No. 4, pp. 281–305; abs. in Berlin. Tierärztl. Wchnschr., 30 (1914), No. 2, pp. 31, 32*).—In the preparation of highly potent precipitating anthrax sera it is necessary to use a strain of bacteria which will become encapsulated when grown on agar medium and the proper kind of animal. No discharge of anthrax bacilli with the feces of the serum animal took place. It was found advisable to draw the blood from the animal 12 days post-injection. Rapidly and highly immunized animals were found to lose in titer after a short time, but the sera from animals immunized slowly but intensely retrogress only slowly.

The precipitating sera do not lose their activity when held at a temperature of 37 to 45° C. for several days, but when temperatures of 56 to 60° are employed they lose their precipitating powers. In other words, the precipitins are converted into precipitoids.

The addition of complement will not reactivate the sera. Freezing once does not affect the precipitation; centrifuging at 13,800 revolutions has likewise no effect. Repeated freezing and thawing, however, affects the precipitating powers of the upper strata of the sera held in tubes, but there is no noticeable increase in precipitins in the lower layers. Concentration of the volume in a desiccator does not increase the activity of the sera nor does slight dilution affect the titer.

Drying the sera and then mixing them with water results in a cloudy solution which can not be used for tests. Drying on filter paper renders the precipitins insoluble, and only a very weak reaction results with the fluid obtained by dissolving the serum solids on the paper. Precipitins, when dried, will stand a greater degree of heat than when in the liquid state and they are not destroyed by alcohol, ether, and chloroform.

The precipitins of anthrax sera belong to the globulins and in most cases they are distributed in this group among the eu- and pseudoglobulins. According to Ascoli the antigen substances of anthrax bacilli give a biruet reaction but none of the other protein reactions. These authors doubt if the biuret test is satisfactory for determining whether bacillary extracts contain proteins.

Viability of the anthrax bacterium, M. J. HARKINS (*Amer. Vet. Rev., 45 (1914), No. 1, pp. 76–78*).—Experiments made with pieces of suture silk which had been immersed in a liquid culture or suspension of anthrax bacteria and then dried and placed in a glass test tube, sealed with a cotton plug and tight fitting rubber stopper, show that anthrax spores are able to propagate for at least 13 years and 11 months, and that the spores under these conditions retain some virulence, if not all, for the same length of time.

Bacteriological diagnosis of anthrax by dried swabs from the blood, and by examination of the skin, J. M. BEATTIE and U. R. PHADKE (*Abs. in Jour. Path. and Bact., 18 (1913), No. 1, pp. 115, 116*).—"An examination of the skin of infected animals is too uncertain to be of any value as a means of diagnosis. Spores are not formed in dried swabs or in dried skin, and therefore heating the swab or the skin to 70° C. renders a diagnosis still more uncertain; in our experiments it destroyed all chance of a diagnosis. Small quantities of dried, infected blood may give a negative result on examination, and therefore in the examination of hides considerable areas and those taken from different parts of the body should be examined."

The curability of dourine, MONOD (*Rev. Vét. Milit., 1912, Dec.; abs. in Rev. Vét. [Toulouse], 39 (1914), No. 3, pp. 164, 165*).—The author finds the form of dourine that occurs in North Africa to be curable through the administration of atoxyl and of orpiment (arsenic trisulphid), on alternate days, until five doses have been given. A 10 per cent solution of atoxyl is administered subcutaneously, the dose varying from 4 to 5 gm. The orpiment is administered in boluses of 30 gm.; three cases of poisoning, two ending fatally, have been observed to follow. After an interval of 10 days the treatment is repeated.

Progress and results in transmission experiments by the Imperial Health Department with cytoryctes cocci recorded by Siegel as the cause of foot-and-mouth disease, and with the bacteria said by von Niessen to be the cause of this disease, WEHRLE and ZWICK (*Arb. K. Gsndhtsamt., 45 (1913), No. 4, pp. 522–583, figs. 29; abs. in Rec. Méd. Vét., 91 (1914), No. 3, pp. 102–104*).—The commission composed of a number of veterinarians appointed to investigate the subject find that the cytoryctes cocci of Siegel (E. S. R., 28, p. 376) while pathogenic are not of etiologic importance in foot-and-mouth disease, and that the microbe of von Niessen does not represent the infective agent, nor is it of etiologic importance, in this disease.

Experiments with Tryposafrol in foot-and mouth disease, SEILER (*Berlin. Tierärztl. Wchnschr., 30 (1914), No. 13, pp. 219–224*).—The author's work indicates that Tryposafrol has no protective or curative value in foot-and-mouth disease.

Notes on complement fixation in glanders, L. FROTHINGHAM and S. O'TOOLE (*Jour. Med. Research, 28 (1913), No. 2, pp. 333–344*).—The results show that complement may be obtained directly from the heart of a guinea pig without injury to the animal. This allows a series of high titer guinea pigs to be kept for this purpose only, and these can be bled in rotation. The complement may be kept in an ordinary ice box for 3 days with but little deviation of titer in either direction.

"Hemolytic amboceptor kept in a dark room averaging 45 to 50° F. for more than 6 months still holds it original titer. Rabbits may be immunized by the intraperitoneal injection of washed undiluted sheep corpuscles. The immunized rabbit may be bled from the heart without injury and be kept for the future production of amboceptor. Antigen must be titrated against a known positive glanders serum, and again titrated (as a control) without positive serum. Univalent and polyvalent glanders antigens have been kept in a dark room at 45 to 50° for more than 15 months without loss of titer. They have also been kept in an ordinary ice chest for 4 months, and probably can be kept longer under these conditions without deterioration. Titration and the test proper may be much hastened by placing the tubes in a water bath at 37 to 40° C.

"Clear horse serum, rarely needing centrifugalizing, may be obtained by allowing the blood to clot in an inverted test tube against a cork stopper; the clot adheres to the cork and is removed with it. Positive and negative (glanders) horse sera, inactivated, have been kept in a dark room at 45 to 50° F.

for more than a year without deteriorating, and are still occasionally used as controls in the test. Uninactivated positive and negative sera have been kept in an ordinary ice chest for 4 weeks, and undoubtedly can be kept longer under these conditions without deterioration. Naturally occurring hemolytics in a serum may be detected in a test by running a hemolytic control."

Further experiments on the biology of Johne's bacillus. F. W. TWORT and G. L. Y. INGRAM (*Centbl. Bakt. [etc.], 1. Abt., Orig., 73 (1914), No. 4–5, pp. 277–283*).—The results obtained indicate that the animal's food may be the source of the essential substance for the bacillus rather than any substance metabolized by the animal itself, but there is no definite proof that this is so.

A case of Johne's disease successfully treated. J. M'FADYEAN (*Jour. Compar. Path. and Ther., 27 (1914), No. 1, pp. 76–78, figs. 2*).—A Devon cow about 7 years old suffering from Johne's disease, which came under observation on August 8, is reported to have recovered from the disease. The treatment consisted in the daily administration from August 12 to September 30 of an ounce of a preparation consisting of ferrous sulphate 5 oz., dilute sulphuric acid 5 oz., and water 1 pint, in a pint of water.

Serodiagnosis of rabies. C. A. ZELL (*Amer. Jour. Vet. Med., 8 (1913), No. 12, pp. 637–640, figs. 2*).—In the experiments animals were infected with street virus and the serum obtained from these animals was tested according to Wassermann's technique (complement fixation reaction), using an antigen made from the submaxillary glands. In all of the animals in which a positive reaction was obtained, i. e., those which came to autopsy, Negri bodies were detected in the brain.

The experiments were conducted with dogs, rabbits, goats, and cats. "Negative reactions were obtained in the folowing controls: Normal rabbits, dog, cat, dog with distemper, man." "By means of this reaction a diagnosis can be made immediately, without destroying the animal, and further, a test after the completion of the Pasteur treatment will determine whether or not immune bodies are present in the patient's serum whereby a greater degree of assurance can be given the patient."

Rinderpest: Further investigations on questions connected with the economical production of antiserum. J. D. E. HOLMES (*Mem. Dept. Agr. India, Vet. Ser., 2 (1913), No. 2, pp. 33–80*).—The results of some experiments obtained in the laboratory of the Agricultural Research Institute at Pusa, India, made it imperative that the methods in use for immunization should be abandoned. The newer methods, which have been employed during the past 2 years, have given good results.

The first experiments reported in this work dealt with the value of serum prepared from bulls hyperimmunized by injections of blood from hill bulls during the progress of a modified attack of rinderpest produced by simultaneous injections of serum and virus. The data show that it is possible to modify the attack of rinderpest in these animals by an injection of serum without destroying the value of their blood as an antigen and without sacrificing the animals.

In studying the value of the serum obtained after a natural recovery or after an immunizing reaction only, it is pointed out that the serum is little inferior in potency to that taken after the process of hyperimmunization. Successive bleeding of plains bulls, hill bulls, and buffaloes brought out the fact that the potency of the serum decreases more rapidly in the plains bulls than in the other animals mentioned. The first and second bleeding of all three kinds of bulls yielded a sufficiently potent serum to maintain the standard protective dose. "The third bleeding of hill bulls and buffaloes is about the standard dose and that of plains cattle is below the required potency."

"As a result of the experiments the volume of virus used for injections in the process of hyperimmunization has been further reduced to 2.5 cc. per pound body weight in the case of plains cattle. For hill bulls and buffaloes a volume at the rate of 3 cc. per pound body weight is now used. Further, it has been found unnecessary to increase the volume of virus in each successive injection, as was generally practiced. Animals reinjected several times with the same volume continue to produce a serum of value equal to that obtained after the first injection."

Some further contributions in regard to the chemotherapeutic action of antimony preparations for spirochete and trypanosome diseases. P. UHLENHUTH and G. HÜGEL (*Deut. Med. Wchnschr., 39 (1913), No. 50, pp. 2455–2457*).—Among a number of organic antimony preparations the following were found to be active against spirillosis in fowls: The sodium salts of acetyl-p-aminophenylantimonic acid, benzolsulphon-p-aminophenylantimonic acid, p-urethanophenylantimonic acid, m-amino-p-urethanophenylantimonic acid, m_1 m^1-diamino-p-oxy-p_1-chlorarsenostibiobenzoldihydrochlorid, and m_1 m^1-diamino-p-oxyarsenostibiobenzol. The first three named substances also gave good results in curative tests for rabbit syphilis, and the first two and last two, as well as p-anisylantimonic acid, in experimental dourine in mice. Acetyl-p-aminophenylantimonic acid was also effective in mouse nagana.

In addition to these metallo-organic compounds experimental tests were made with stibium arsenicosum, a colloid preparation with antimony hydroxid, $Sb(OH)_3$.

The inorganic preparations were of no value in fowl spirillosis.

The present status of our knowledge of the trombidiases of man and domestic animals and a new trombidiasis of the goat. R. GALLI-VALERIO (*Centbl. Bakt. [etc.], 1. Abt., Ref., 56 (1913), No. 5–6, pp. 129–145, figs. 4*).—The author states that he has been unable to find any report of the occurrence of this disease in the goat prior to his study of a very grave affection among goats in the Valtelline region, which is here reported upon. The parasite concerned was *Microtrombidium pusillum*, a species which the author had previously found in the same region on the dog.

About the formation of protein and mucin by tubercle bacilli. F. WELEMINSKY (*Berlin. Klin. Wchnschr., 49 (1912), No. 28, pp. 1320–1322; abs. in Chem. Zentbl., 1912, II, No. 16, p. 1386*).—In cultures of the tubercle bacillus, mucin was repeatedly detected; coagulable albumin was also noted. The mucin does not seem to originate from the dead tubercle bacilli and must consequently be a product of metabolism. The methods used which predispose to mucin formation diminish the virulence of the organism.

A new contribution to the pathology of tuberculosis infection. A. CALMETTE and C. GUÉRIN (*Compt. Rend. Acad. Sci. [Paris], 156 (1913), No. 1, pp. 34–37; abs. in Rev. Gén. Méd. Vét., 21 (1913), No. 246, pp. 323–325*).—Some authors believe that tuberculosis in cattle, especially the pulmonary form, is due to the ingestion of tubercle bacilli, and others think it caused by the inhalation of tuberculous particles. In order to determine which of the above theories is correct, some experimental tests with cows were conducted. Five adult cows affected with pulmonary tuberculosis were placed in a barn and faced toward the wall. The excrement of all of these animals was infectious for rabbits.

About 3 meters behind these animals ten 10-months-old heifers were quartered but separated from the other animals by a wooden barrier. The barn was so arranged that the urine flowing from the tuberculous cattle would run into the pens of the healthy animals and consequently soil their litter. The cattle were left together in this building for 11 months and then tested with

tuberculin. Five, or one-half of the healthy animals, reacted to tuberculin after this time, 4 showing infection of the lungs and none of the lung cases being free from tuberculosis of other areas. One of the animals showed an infection of all the lymphatic glands; another was infected in the mesenteric, mediastinal, and retropharyngeal glands; another in the bronchial and retropharyngeal glands and lungs; the fourth in the mediastinal glands and the lungs; and the fifth had all glands except the retropharyngeal affected.

The authors are inclined to believe that tuberculosis, like glanders, emanates from the ingestion of the pathologic material.

[Tuberculosis in man and bovine], Wawrinsky (*Off. Internat. Hyg. Pub. [Paris]. Bul. Mens., 5 (1913), No. 8, pp. 1348–1351*).—This reviews the findings of the Swiss commission for the investigation of tuberculosis.

[Tuberculosis in man and bovine], Bentzen (*Off. Internat. Hyg. Pub. [Paris], Bul. Mens., 5 (1913), No. 8, pp. 1343–1348*).—This discusses the possibility of infecting man from bovine sources, and the Norwegian literature pertaining to this topic is briefly referred to.

The statistics which are given seem to show that the number of cases of the disease in man are the highest in those regions where the greatest number of cases in bovines exist as detected by the tuberculin test. In Norway the use of the tuberculin test is not obligatory, and in localities where the population is less than 1,000, the meat inspection service is not rigid. The author maintains that in order to prevent the disease in man it is necessary to control both the human and the bovine sources of the disease.

Tuberculin, W. G. Ruppel (*Deut. Med. Wchnschr., 39 (1913), No. 50, pp. 2462–2466*).—A discussion in regard to the various tuberculin preparations and the chemical composition of tuberculin.

Information on "huaicú," J. S. Acosta (*Bol. Min. Agr. [Buenos Aires], 16 (1913), No. 5–6, pp. 649–659*).—This paper relates to a disease of domesticated Herbivora, known as "huecú" or "huaicú," which occurs in certain regions of Patagonia. It is caused by the ingestion of a grass that the natives know by the name "coirón blanco." The disease is said to be similar to the tembladera of Rivas and Zanolli (E. S. R., 23, p. 288), and to the pataleta of Quevedo (E. S. R., 30, p. 783).

[Infectious vaginal catarrh and contagious abortion of cattle] (*Arch. Wiss. u. Prakt. Tierheilk., 40 (1914), No. 3, pp. 193–244; abs. in Cornell Vet., 4 (1914), No. 1, pp. 45, 46*).—Two articles are here presented, the first (pp. 193–211) by P. Schumann on Clinical Investigations of Infectious Vaginal Catarrh and Sterility of Cattle; the second (pp. 212–244) by E. Hieronymi on Bacteriological Investigations of Infectious Abortion of Cattle.

The investigation by Schumann included the examination and study of 2,715 animals in 43 herds. "The determination of the presence or absence of infectious vaginal catarrh in a herd can not be done, as many believe, through the examination of the vagina of a few animals but only through a careful study of the whole herd and the sexual life of each animal. The presence of an acute case alone determines a diagnosis. The mere presence of yellowish-red nodules in the vaginal mucosa should only be considered with the greatest caution as a diagnostic sign. Infectious vaginal catarrh should be considered as existing in a herd if a large number of the animals are affected with nymphomania, without extensive alteration being present in the internal generative organs of these animals.

"Infectious vaginal catarrh should be regarded as healed if the nodules become pale or disappear and the number of nonpregnant animals not due to organic derangement has become small. It should be kept in mind that the nodules do not always completely disappear but may persist for a long time

and as such are harmless. The number of animals which become sterile after affection with infectious vaginal catarrh is relatively large. Sterility, however, does not bear a direct relationship to the number of nodules present in the mucous membrane of the vagina of these cases. Most of the sterile cases have well marked changes in the ovaries, uterus, or cervix.

"Infectious vaginal disease is often combined with infectious abortion. Abortions, however, are not to be attributed to the vaginal disease but are due to the presence of the Bang abortion bacillus. Abortion is often followed by transitory sterility due to retained placenta. On the other hand, the number of cases becoming permanently sterile following abortion is relatively small."

In the bacteriological investigations the author made use of 8 aborted fetuses. In investigations of methods of diagnosing the infection 259 tests were made. "The cause of infectious abortion in cattle is the abortion bacillus of Bang. The abortion organism can be recovered from aborted fetuses. Aborted fetuses show pathological changes which are characteristic of infectious abortion. The agglutination and complement fixation tests are of great help in the diagnosis of this disease. The precipitation test is not reliable for the diagnosis of contagious abortion. Abortion, likewise, is not a reliable agent in the diagnosis of this infection. In the serum of aborted fetuses agglutinins, precipitins, and bacteriolytic amboceptors of the abortion bacilli are not present. The results of the complement fixation or the agglutination test can not be considered as reliable data upon which to base a prognosis. These tests simply indicate whether the animal has been infected with the Bang organism. An infection may not be followed by an abortion. Immune bodies may simply be formed in the body of the infected animal. These antibodies can be found in the blood in undiminished quantities, 2 years and 10 months after abortion. Infectious vaginal disease has no casual relation to infectious abortion."

A bibliography accompanies each account.

Polyarthritis in sheep caused by the swine erysipelas bacillus (Bacillus rhusiopathiæ suis), J. POELS (*Folia Microbiol. [Delft], 2 (1913), No. 1, pp. 1–9, pl. 1*).—In the course of his investigations the author found nine sheep which were suffering from polyarthritis caused by *B. rhusiopathiæ suis*, and thinks that this organism is frequently the cause of the disease.

Pleuro-pneumonia of goats in the Kangra District, Punjab, India, G. K. WALKER (*Jour. Compar. Path. and Ther., 27 (1914), No. 1, pp. 68–71*).—"The pleuro-pneumonia of goats met with in Kangra appears to be identical with the enzootic pleuro-pneumonia of goats described by Nocard and Leclainche as occurring in Algeria, the Pyrenees, and the Thuringian mountains. The symptoms and lesions are similar, and the failure to transmit the disease from animal to animal is coincident.

"The value of the above experiments is depreciated, no doubt, from the fact that plains animals had to be used. If possible further investigations with hill goats will be made with the object of proving the possibility of transmission by means of intrapulmonary inoculation."

Some common internal parasites (worms) of hogs and their treatment, C. H. STANGE (*Iowa Sta. Circ. 14 (1913), pp. 4, figs. 4*).—A brief popular account.

The present status of the hematology of domestic animals, with a report of blood investigations in diseases of the nervous system of the horse, P. SCHRÖPFER (*Der jetzige Stand der Haematologie der Haustiere sowie einige Bluntuntersuchungen bei nervösen Erkrankungen des Pferdes. Inaug. Diss., Univ. Leipsic, 1912, pp. 60*).—The first part of this paper (pp. 7–28), consisting of a review of the subject, is followed by a report of personal investigations, including methods, and studies of nine cases of contagious cerebro-spinal menin-

gitis (Borna disease), and of cases of congestion of the brain, subacute leptomeningitis, subacute encephalitis, purulent meningomyelitis, subdural abscess, and chronic hydrocephalus.

The investigations led to the conclusion that there is no regularity in the blood findings in these cases. A bibliography of 37 titles is appended.

Recent investigations of contagious pneumonia of horses and the salvarsan treatment of this disease, O. SCHWARTZKOPF (*Amer. Vet. Rev., 44 (1914), No. 5, pp. 634–641*).—This is a review of the subject.

Streptococcic infections of the deep air passages of the horse, J. EGGINK (*Streptokokken-Infektionen der tiefen Luftwege beim Pferde. Inaug. Diss., Univ. Bern, 1912, pp. 33*).—It is very certain that in inflammation of the deep air passages of the horse the streptococci play an important etiological rôle. These streptococci possess a strong hemolytic action. In most cases they possess the power to encapsulate on weak coagulated horse serum.

A malignant catarrhal fever of horses and mules, R. GRAHAM (*Kentucky Sta. Ext. Circ. 12 (1913), pp. 16, pls. 8*).—This circular relates to an acute, febrile, contagious disease of solipeds that made its appearance in a rather virulent form in several counties of Kentucky. The paper deals with the history, cause, symptoms, complications, methods of combating the spread of the disease, treatment, etc.

Investigations of the occurrence and clinical importance of sarcoma in domestic fowls, K. ELSNER (*Untersuchungen über das Vorkommen und die klinische Bedeutung der Sarkome beim Hausgeflügel. Inaug. Diss., Univ. Leipsic, 1912, pp. 41, pls. 2*).—This paper includes reports of 18 cases personally observed.

Nematodes of the pharynx and esophagus of the chicken, J. CIUREA (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 15 (1914), No. 1, pp. 49–60, pls. 2, figs. 3*).—This paper deals with *Trichosoma strumosum* and *Gongylonema ingluvicola*.

RURAL ENGINEERING.

The mechanical engineer's reference book, H. H. SUPLEE (*Philadelphia, 1913, pp. 964; rev. in Engin. Rec., 69 (1914), No. 7, pp. 202, 203*).—This book gives in condensed form much of the data required in mechanical engineering.

List of references to publications relating to irrigation in the public library of New South Wales, G. H. GIFFORD (*Sydney, N. S. Wales: Public Library, 1913, pp. 32*).—This list includes not only references to irrigation in Australia but to such works in all countries where irrigation is practicable.

The question of agricultural hydraulics in Tunis (*Bul. Dir. Gén. Agr. Com. et Colon. Tunis, 17 (1913), No. 70, pp. 225–380, pls. 13, figs. 24*).—This publication takes up in some detail the question of the conservation and utilization of the hydraulic resources of Tunis, particularly for irrigation. Reports and studies relative to projected work of this nature, which include rainfall, runoff, and geological data and maps and charts, are as follows: Archaeology and Hydraulics in Tunis, by D. L. Carton (pp. 227–248); The Dam and Reservoir of Hammam-Zriba near Zaghouan, by J. Coignet (pp. 249–265); The Legal Management of Water in Tunis, by G. Barrion (pp. 267–275); How to Improve the Management of Water, by L. Delaporte (pp. 277–283); Method Permitting the More Abundant Use of Wells and Water Sources, by M. Malcor (pp. 285–302); Rainfall of Tunis and Agricultural Hydraulics, by G. Ginestous (pp. 303–345); Agricultural Hydraulics in Tunis, by R. Gagey (pp. 347–355); Prosperity of Irrigated Crops in Algeria, by R. Marés (357–369); and Particular Features of Oasis Irrigation, by P. Penet (pp. 371–380).

Report of public works of Dutch India (*Verslag Burgerl. Openb. Werken Nederland. Indië, 1910, pt. 4, pp. 269, pls. 31*).—This report deals with irrigation and with the conveyance, diversion, and storage of water supplies including both projected and finished works. Detailed plans, maps, charts, and hydraulic and other data accompany the report.

Behavior of cup current meters under conditions not covered by standard ratings, F. C. SCOBEY (*U. S. Dept. Agr., Jour. Agr. Research, 2 (1914), No. 2, pp. 77–83, pls. 2, figs. 2*).—Tests made to determine the applicability of standard ratings when the meter is held near the water surface, near the sides or bottom of the channel, or out of horizontal, and to determine the effect of the movement of the meter in the water when the "integration" method is used, and of dulling the pivot bearing of the meter, are reported and discussed, the results obtained being compared with those of a standard rating

The main point brought out is that the cup current meter should be actually rated at the surface and bottom of the channel if it is to be operated at these points. The importance of keeping the meter horizontal is also clearly indicated. The added friction due to dulling the pivot bearing had more influence at low velocities, and for velocities greater than 1 ft. per second the sharpness of the pivot was immaterial. When held close against the vertical concrete wall of the channel so that the open and closed sides of the turbine were brought next to the wall alternately, the meter ran true to the standard curve but disregarded the cycloidal motion of the water.

All vertical movement of the meter when the vertical integration method was used tended to turn the wheel in the same direction as did the flowing water. For slower movements of the meter this tendency was insufficient to overcome the internal friction in the meter, but when it was operated in running water the water overcame the internal friction and the force due to the vertical movement of the water was still available to turn the wheel and cause it to overregister. "It appears that a cup meter underregisters at all points nearer the surface than about 0.3 ft., and also while very near the bottom. Therefore, in a process of vertical integration with a cup meter there is a tendency to overregistration at all times due to the vertical motion, and a tendency to underregistration while the meter is passing from 0.3 ft. below the surface up to the surface and back to that point and while near the bottom."

Cost and methods of clearing land in the Lake States, H. THOMPSON and E. D. STRAIT (*U. S. Dept. Agr. Bul. 91 (1914), pp. 25, figs. 10*).—This bulletin gives detailed cost data and discusses land clearing in Michigan, Wisconsin, and Minnesota by explosives alone, by explosives used in connection with stump pullers or block and tackle, by stump pullers alone, and by power machinery. In addition data of the work of clearing 20 different tracts are presented.

There are said to be approximately 11,954,628 acres of logged-off land in Michigan, 10,792,100 acres in Wisconsin, and 11,768,000 acres in Minnesota, a large part of which will make good agricultural land if cleared and properly managed.

"Cutting and burning the second growth, pasturing for several years, and keeping down all sprout growth is the most economical method of handling all logged-off lands before stumping them. Explosives play an important part in clearing land. On the heavier soils dynamite, with 20 to 30 per cent of nitroglycerin or its equivalent, is to be preferred. Cooperative buying in large quantities is recommended. Stump pullers reduce the cost of stumping on lighter soils. On the heavier soils the difference between the cost of clearing by explosives and by the use of stump pullers is very slight.

"The cost of clearing the better grade of white-pine logged-off land will average $10 per acre for disposing of the brush and $25 to $30 per acre for disposing of the stumps. Some green hardwood lands and unburned swamp lands will cost as much as $100 per acre. Some of the poorer jack-pine lands can be cleared for $5 per acre or less. The cost of disposing of the stumps after pulling practically equals the cost of pulling. A tripod or a boom piler is recommended to facilitate piling and burning."

It is concluded that the settler with little capital and no experience will meet with serious difficulties in attempting to make a farm out of a tract of logged-off land, and it is recommended that "in all localities where land companies are selling lands to settlers, no tract of land be sold unless it contains at least 10 acres of land cleared ready for the plow."

A manual of the law of roads and highways in the State of Kansas, W. R. ARTHUR (*Topeka, Kans., 1913, 13. ed., pp. 126*).—This handbook includes the laws relating to roads and highways passed by the legislature of the State up to and including the session of 1913, and is intended as a text-book and compilation of the duties and powers of highway officials.

History of road legislation in Iowa, J. E. BRINDLEY (*Iowa City, Iowa, 1912, pp. XIII+422*).—This volume deals with road legislation in Iowa from the year 1838.

Bibliography of road-making and roads in the United Kingdom, DOROTHY BALLEN (*London, 1914, pp. XVIII+281*).—The contents of this bibliography are classified under the general headings of (1) history and description, (2) administration, (3) engineering, and (4) traffic.

An investigation of sand-clay mixtures for road surfacing, J. C. KOCH (*Proc. Amer. Soc. Civ. Engin., 40 (1914), No. 2, pp. 269–296, figs. 9; abs. in Engin. and Contract., 41 (1914), No. 11, pp. 321–324, fig. 1*).—The author presents the results of two years' studies in both field and laboratory of sand-clay mixtures for road surfaces and describes an approximate field method for the examination of sand-clay mixtures and methods of construction with natural and artificial mixtures.

The conclusions from the laboratory tests are as follows:

"The content of sand smaller than No. 60 is of little value in the mixture, that smaller than No. 100, except in very small quantities, is detrimental. The greater the proportion of coarse to fine sand the harder and more durable will the road surface be. For the best possible results with sand-clay mixtures, the sand smaller than No. 10 and larger than No. 60 should not be less than 45 per cent nor more than 60 per cent, by dry weight, of the entire sample. In addition, the sand smaller than No. 10 and larger than No. 60 should be composed of about equal parts of Nos. 20, 40, and 60. The total sand content should in no case exceed 70 per cent by weight of the total sample.

"Test cylinders of the sand-clay mixture, 1 in. in diameter and 3 in. long, should, when thoroughly dried in air bath at 100° C., take at least 2 minutes, when immersed in water at 21°, to crumble down to the natural slope of the material, and preferably should take 6 minutes. If the cylinder fails in this test, it should be regarded with suspicion. If the sand analysis is poor and the cylinder test is also poor, the material is not worth using."

Similarly, test cylinders made from the clay removed from the sample should take at least 2 minutes to crumble. If the material fails in this test but passes that of the preceding paragraph it may be used, but indicates a poor quality of binder.

Standards of concrete road construction (*Engin. Rec., 69 (1914), No. 8, pp. 214–216*).—A résumé of committee reports at the National Conference on

Concrete Road Building bearing on standard practices in concrete road construction includes recommendations as to specifications, construction, maintenance, and cost.

The contraction and expansion of concrete roads, R. J. WIG, N. H. TUNNICLIFF, and W. A. MCINTYRE (*Abs. in Engin. and Contract., 41 (1914), No. 8, pp. 257–262, figs. 4; Engin. News, 71 (1914), No. 9, pp. 446–449, fig. 1*).—Experimental data are reported relating to the effect on expansion and contraction of concrete in concrete roads of changes in the temperature and variations in the moisture content of the concrete, variation in the condition and character of the sub-base, and excessive loading by traffic. These data "indicate that the effect of moisture content is very much greater than the effect of temperature change, and may be sufficient to cause a stress in the concrete opposite to that which would be caused by a normal temperature change. A variation in the quality of the concrete will cause a variation in the tendency to expand and contract with change in moisture content."

It is concluded that a proper combination of change in temperature, change in moisture content, and friction have made possible the construction of long slabs which have remained free from cracks. "With a proper understanding of the physical phenomena . . . and a proper application of engineering principles it is believed . . . that all expansion and contraction of concrete in roads can be so controlled as permanently to avoid cracking."

Design of reinforced concrete, C. AUBRY (*Calcul du Beton Arme. Paris, 1913; rev. in Sci. Amer., 110 (1914), No. 8, p. 168*).—This is a compilation of formulas, tables, and diagrams in compact form for use in designing and estimating reinforced concrete.

Concrete destruction by ground water containing sulphates (moor water), SCHEELHAASE (*Abs. in Wasser u. Abwasser, 7 (1914), No. 11, p. 464*).—Investigations on the effect of moor water on concrete led to the conclusion that water containing gypsum, such as moor water, is able to destroy concrete, this destruction being produced by increase in volume. The effect on concretes made from different makes of cement was entirely different and the age of the concrete had little influence on the processes of destruction. Concrete made with certain cements was not destroyed.

How to calculate the losses in gas engines, G. W. MUENCH (*Power, 39 (1914), No. 7, pp. 248, 249*).—Simple calculations are given showing how to figure the heat balance of a gas engine with a degree of accuracy which is considered close enough for ordinary purposes.

Notes on power variation with atmospheric changes, H. CHASE (*Gas Engine, 15 (1913), No. 11, pp. 627, 628*).—Tests of an internal-combustion motor showed appreciable power variations with marked changes in barometric pressure.

Power losses due to tardy ignition, R. TRAUTSCHOLD (*Gas Engine, 15 (1913), No. 11, pp. 604–607, fig. 1*).—The author points out by data, curves, and discussion that tardy ignition in an internal combustion engine decreases the power output by reducing the mean effective pressure and by causing inefficient expansion of the products of combustion in the engine cylinder.

Elementary machine design, W. C. MARSHALL (*New York and London, 1912, pp. VIII+320, pls. 3, figs. 193; rev. in Science, n. ser., 39 (1914), No. 999, p. 288*).—This is a book of information and instruction on machine details, and is intended for students who have not studied mechanics and mechanism, although considered to be of service to draftsmen who are already familiar with the principles and methods of machine design. It contains chapters on machine drawing, rivets and riveted joints, piping, screws and bolts, shafting

and shaft couplings, stuffing boxes, bearings, journals, hangers, pistons and piston rods, connecting rods, pulleys, belting, gearing, and valves.

Methods for calculating the accomplishment of the motor plow, O. KASDORF (*Rev. Min. Indus. Uruguay, 1 (1913), No. 6, pp. 105–111*).—The author describes and illustrates the use of formulas for calculating the accomplishment of traction plows per unit of time. Tables of test data show the relation between the draw bar pull and the weight of the tractor and the relation between the effective motor horsepower and effective draw bar horsepower. The author considers the resistance of the soils per unit area to be of prime importance in his computations.

Sawing ice by electricity (*Elect. World, 63 (1914), No. 8, p. 427, figs. 2*).—The use of electrically driven ice saws is briefly described and illustrated.

The plant consists of two sets of 36-in. saws installed in an artificial channel 20 ft. wide, each set being belt-driven by an induction motor. The ice is floated in 12 by 18 ft. cakes to the artificial channel where it is cut into 20 by 28 in. blocks. This method is claimed to effect a great saving in time and labor.

Farm structures, K. J. T. EKBLAW (*New York, 1914, pp. VIII+347, figs. 159*).—This book, written for both the teacher and the progressive farmer, is intended to impart a working knowledge of the construction of practical and economical farm structures. A description of building materials is followed by a discussion of farm building location and the basic methods employed in simple building construction, including designing and estimating. The application of the methods is illustrated by typical plans of various farm buildings and structures. Descriptions of the more essential requirements in the way of equipment and farm life conveniences, including heating, lighting, and ventilation of buildings, and water supply, plumbing, and sewage disposal are appended.

Modern farm buildings, A. HOPKINS (*New York, 1913, pp. 206, pls. 47, figs. 77*).—This work suggests approved designs for the cow barn, dairy, horse barn, hay barn, sheepcote, piggery, manure pit, chicken house, root cellar, ice house, and other buildings of the farm group, based on practical, sanitary, artistic, and financial considerations.

Farm buildings, C. J. WHILLAS (*Jour. Dept. Agr. So. Aust., 17 (1914), No. 6, pp. 654–659, figs. 6*).—Plans are given of farm buildings, including the stable, barn, and machine shed, with a discussion.

The fool-proof poultry house, T. E. QUISENBERRY and R. SEARLE (*Missouri Poultry Sta. Bul. 4 (1914), pp. 61, figs. 44*).—This bulletin illustrates and describes a number of poultry houses which "are the result of several years of very careful testing and experimenting with practically all of the styles of poultry houses found in the country to-day." The types dealt with are recommended to farmers and the poultry raisers of Missouri as being peculiarly adapted to the conditions of that State.

Separation of horses in the stable, M. RINGELMANN (*Jour. Agr. Prat., n. ser., 26 (1913), No. 35, pp. 273, 274, figs. 2*).—This article describes and illustrates devices for easily and safely separating horses in stalls.

Farm conveniences, W. H. DAY (*Ann. Rpt. Ontario Agr. and Expt. Union, 34 (1912), pp. 81–89*).—Farm water systems, farm sewage disposal, farm power, and the theory of the hydraulic ram are briefly discussed.

Estimating the cost of modern improvements (*Dom. Engin., 66 (1914), No. 9, p. 268*).—A table of approximate figures is given showing the cost of water supply, plumbing, sewage disposal, hot air or hot water heating, gas and electric lighting, laundry and dairy equipment, gasoline storage, vacuum cleaner, and refrigerating plant for country houses in proportion to the cost of the house. The houses used range from a 5-room cottage costing $2,000 to a

15-room country residence costing $15,000. "Generally, as the basic cost of the house is greater, the percentage that expresses the cost of equipment for same becomes less."

Water supply for farm or cottage (*Jour. Soc. Agr. Suisse Romande, 55 (1914), No. 2, pp. 29–34, figs. 3*).—An automatic water elevator for use in obtaining rural and residential water supplies is described and illustrated which is claimed to be more efficient and convenient than the hydraulic ram. This machine consists essentially of an impulse cylinder below and a compression cylinder above. Besides the impulse cylinder is placed a governor which regulates the entrance and escape of the impulse water. The piston of the compression cylinder is directly connected to that of the impulse cylinder by an iron bar. The disadvantages of this system are said to be its higher cost and the necessity of special construction for each installation.

Rural water supply, C. A. Ocock (*Country Gent., 79 (1914), No. 8, pp. 376–378, figs. 3*).—The author briefly describes the gravity, compression, and pneumatic systems for supplying running water to farm homes and gives hints as to installation, operation, and cost.

Disposal of sewage from isolated country houses, mansions, and public institutions, T. W. Stainthorpe (*Agr. Jour. Union So. Africa, 7 (1914), No. 1, pp. 60–62*).—In a discussion of sanitary conditions in rural South Africa, the author gives a brief description of a small "bacterial" installation for a country house, mansion, or institution with an average population of 15 or 20.

Prevention of malaria, R. H. von Ezdorf (*Pub. Health Rpts. [U. S.], 29 (1914), No. 9, pp. 503–508, pls. 2*).—Suggestions on how to screen the home to keep out effectively the malarial mosquito are given, these dealing principally with material, screening of doors, windows, and other openings where mosquitoes enter, care and repair of screens, and the economic value of screening.

The best size of mesh for all purposes is said to be the 18 mesh, that is, 18 strands of wire to the linear inch in either direction. A 16 mesh is said to be quite efficient and if carefully painted will practically be equal to an 18 mesh. "Even copper or bronze wire should be treated with some varnish or paint, as it is likely to oxidize and corrode when exposed to a damp climate, particularly near the seashore. . . .

To be of proper construction, a doorframe should be made of cypress or other seasoned wood 1 to 1½ in. thick, well braced and painted. The wire should be of 16 or 18 mesh. The lower panel should be covered on the inner side with a one-fourth inch mesh wire guard to protect the screening. . . . An easy fitting door, fully one-fourth inch clear all around the edge is best, and to make it mosquito proof it will be necessary only to tack a strip of light canvas 1 in. wide around the top and one side of the door facing on the outer side. . . .

"The most efficient method of screening a window is to screen the entire opening. A well-fitting screen frame which is screwed into place so that it can be removed at the end of the season is probably the best. . . .

"Other places to be absolutely screened are the fireplaces, openings into chimneys for stove pipes, drain holes, ice-box drips through floors, and the like. . . . If the porches are screened, the holes at the bottom for draining off water should also be screened. . . .

"In repairing torn wire screening, a small piece of wire netting cut to size should be placed over the torn opening and fixed into place by sewing or lacing with a strand of the wire."

The economic value of screening is illustrated by a typical example and numerous cost data are given.

Modern practice in heating and ventilation.—XIII, Various devices for forcing circulation in domestic hot water heating plants, A. G. King (*Dom.*

Engin., 66 (1914), No. 8, pp. 231–234, figs. 8).—This article describes and illustrates devices including generators, accelerators, heat retainers and intensifiers, etc., "all of which are designed to allow an increase in the temperature of the water in a hot water heating system by sealing it to the atmosphere and by the maintenance of a small pressure within the apparatus quicken or accelerate the circulation."

Planning lighting installations, J. B. JACKSON (*Jour. Electricity, 32 (1914), Nos. 8, pp. 164, 165; 9, pp. 184, 185, fig. 1*).—The author presents by means of tables of data, diagrams, and discussions, a simple method of calculating illumination for residences which though approximate is considered applicable to the majority of lighting installations.

Housing and town planning, edited by C. ARONOVICI (*Philadelphia, 1914, pp. VI+270*).—This collection includes papers dealing with the new and old house and with town planning. Topics of rural interest are Housing and the Housing Problem, by C. Aronovici; The Workingman's Home and Its Architectural Problems, by F. A. Bourne; The Old House as a Social Problem, by Mildred Chadsey; Fire Waste, by P. Evans; and Rural Housing, by E. S. Forbes.

RURAL ECONOMICS.

Farmers' law, L. V. KOOS (*St. Paul, Minn., 1913, pp. 156, figs. 18*).—The author has attempted to prepare a concise manual of such common and statute laws as bear most closely upon the farmer in his everyday affairs. This edition applies primarily to conditions in Minnesota.

Handbook of agricultural laws, compiled by E. O. LUTHER (*Nashville, Tenn.: Dept. Agr. 1912, pp. 89*).—There are given in this handbook the laws relating to the bureau of agriculture, fertilizers, agricultural seeds, food control, state board of entomology, apiaries, department of immigration, state fairs, live stock control, and legal weights and measures.

The problem of double entry farm bookkeeping, B. LAMBERGER (*Beiträge zu den Problemen der Doppelten Landwirtscaftlichen Buchführung. Diss. Univ. Giessen, 1913, pp. 106*).—The principal part of the author's discussion is devoted to the various methods that may be used to determine the value of the crops which are produced and consumed on the farm and to determine their profitableness or unprofitableness.

Agricultural credit.—Personal or short-term credit (*U. S. Senate, 63. Cong. 2. Sess., Doc. 380, pt. 3 (1914), pp. 32*).—This report contains an analysis of the findings of the United States Commission (E. S. R., 28, p. 301) in regard to the uses of personal or short-term credit as found in European countries. The Commission believes that although it is within the power of Congress to pass laws providing for credit unions or cooperative credit associations and make them fiscal agents of the National Government yet the conditions of agriculture differ so widely, the needs of the farmers vary so greatly, and the status of the different classes of people in rural communities are so unlike that laws relating to short-term credit can best be enacted by the various state legislatures. See also a previous note (E. S. R., 30, p. 792).

Agricultural credit in the French colonies, L. GAMARD and L. TARDY (*Ann. Sci. Agron., 4. ser., 3 (1914), No. 2, pp. 57–83*).—The author outlines the organization of agricultural credit in France and the principal French colonies, and concludes that the only system which can be a success is a mutual credit organization from underneath, that is to say it must be based on local institutions where the members know each other and can observe what is being done with the loans.

The cooperative movement, G. KEEN (*Amer. Coop. Jour., 9 (1914), No. 5, pp. 358–362*).—The author points out that the weakness of the cooperative plan as advocated by Robert Owen was the absence of democratic control and the sense of individual responsibility by the members themselves in the initiation and management of the societies, but that cooperative societies formed upon the plan of the Rochdale system or the Cooperative Wholesale Society of England have been very successful and have also helped to solve the problem of the trusts. He believes that there is no force strong enough to destroy or even to injure seriously the property, power, or influence of a body of intelligent people who organize their own demand for the necessaries of life and proceed to satisfy it by production under their own control. To be successful, however, a cooperative movement must have an educational department to propagate knowledge concerning itself.

Manual on cooperation (*N. Y. Dept. Agr. Circ. 94 (1914), pp. 33*).—Included in this circular are the following articles: A Primer of Cooperation, by M. W. Cole; The Citizens' Cooperative Supply Company, Schenectady, by J. C. Bellingham; One Cooperative Success, by L. C. Tuckerman; The Extent to which Cooperation in Europe is Adaptable to American Conditions, by F. H. Allen and C. C. Mitchell; and Cooperative Buying by Consumers, by E. P. Harris. In addition there is a model form of by-laws for cooperative societies.

"Grand View," a rural experiment in medical cooperation, W. H. BROWN (*Survey, 31 (1914), No. 26, pp. 797, 798, fig. 1*).—The author describes the methods used to establish a hospital in the rural districts of Bucks County, Pennsylvania. This hospital is so organized that any reputable physician can take his patient to it and give him treatment. The nurses are recruited from the rural districts, and after a year's experience in the hospital are sent out to nurse cases under the supervision of the hospital. By means of this scheme it is hoped that the whole countryside will be given the benefit of the best in medical science.

A social survey for rural communities, G. F. WELLS (*New York, 1911, pp. 33*).—The author outlines a scheme for making a social survey and gives a list of 225 items to be included in the questionnaire.

Our recent immigrants as farmers, L. STEINER (*Amer. Rev. of Reviews, 49 (1914), No. 3, pp. 342–345*).—The author shows that most of the immigrants coming to the United States come with the expectation to save enough money from their earnings to return to their native country to buy land. He advocates that an organization be formed to encourage, assist, and direct qualified immigrants to purchase and cultivate farms in the United States instead of migrating to foreign countries to engage in agriculture.

The German-American farmer, J. OCH (*Der Deutschamerikanische Farmer, Columbus, Ohio, 1913, pp. XIX+248, pl. 1*).—The author discusses the migration of Germans to the United States, the coincidence of the spread of grain production to the North Central States with the coming of the Germans, the relation of the first and second generation of Germans to agriculture, and the influence of the Germans upon our social and economic institutions. The book also contains a bibliography and a considerable number of statistical tables.

The question of agricultural population, A. D. WEEKS (*Pop. Sci. Mo., 84 (1914), No. 3, pp. 251–256*).—Among the conclusions reached by the author is that the number of persons engaged in an occupation bears a very close relation to the economic attractions offered. The steady and rapid drift of the agricultural population to the cities implies the economic dominance of the occupations of the city. With an increase of purchasing power the prosperous consumer wants but little if any more of the direct farm products while his desire for other values increases. It is deemed unreasonable to urge a larger

relative agricultural population without simultaneously urging organization among farmers to regulate farm products and to hold prices to a level which would enable them to approximate the standard of living characteristic of cities unless cheap farmers are desired as well as cheap food.

The rural population, T. G. CHAMBERS (*Jour. Farmers' Club [London], 1914, Apr., pp. 45–55*).—Among the general conclusions reached by the author from his study of the changes in the rural population of England and Wales between 1901 and 1911 are that each rural district must be considered by itself, so that it is impossible to generalize for the country as a whole. Some of the causes influencing the rural population are improved traction, better means of communication, intrusion of mining and manufacturing into the rural districts, and increase of residential population. He believes that as a whole the rural population of England and Wales will continue to increase.

The rural problem, H. D. HARBEN (*London, 1913, pp. VIII+169*).—The author discusses the decline in the rural population of England and Wales and its relation to the problem of wages and the housing of farm laborers. He also calls attention to the problems of small holdings, tenancy and ownership, agricultural education, and organizations, and submits a number of recommendations for improving the condition of the farm laborer.

Development of agriculture in the United States and its influence on prices of agricultural products, M. AUGSTIN (*Schr. Ver. Sozialpolit., 141 (1914), pt. 2, pp. 149, pl. 1*).—The author discusses the relative variations in the increases in population, land in farms, improved land, rural population, values of farm property, farms by sizes, and farm mortgages; agricultural associations; transportation facilities; the farm labor question; the use of machinery, manure, and irrigation; the extensive character of American agriculture and importance of the single crop system; and relative changes in the number of live stock and their geographic distribution. He concludes that the agricultural development of the United States has reached a climax and that never again will its exports become sufficiently important to cause a depression in the prices of cattle or grain on the world's market.

Crop yields and prices, and our future food supply, G. F. WARREN (*New York Cornell Sta. Bul. 341 (1914), pp. 185–211, figs. 3*).—Statistical data are summarized from publications of the U. S. Census and the Department of Agriculture, and discussed.

Some of the conclusions reached by the author are that prices that the farmer now receives for animal products are higher than the average for the past 73 years, but that prices received for crops are generally as low or lower. Crop yields east of the Mississippi River have been rapidly increasing in the last 10 to 15 years. It is believed that farmers raise larger crops when they are convinced it will pay. More land also will be brought into use when the prices of farm products will guarantee a profit on the extra expense of clearing, draining, irrigating, etc. There is a tendency for the people in the United States to use more plant foods and less animal foods. To reduce the size of farms and to import cheap labor to help farm is deemed likely to result eventually in more expensive rather than cheaper food. The machinery of distribution after products leave the farm is considered unnecessarily expensive.

An investigation of the phosphorus supply in this country, with a view to restriction of exports, is advocated.

The history of the grain trade in France, 1400–1710, A. P. USHER (*Harvard [Univ.], Econ. Studies 9 (1913), pp. XV+405, pls. 2*).—The author outlines with considerable detail the changes that took place in the systems of marketing grain in the different parts of France during this period. Among

the features discussed are the history of the Parisian markets, the Chambre d'Abondance at Lyon and the wholesale merchants, Lyonese merchants and dearth in the producing regions, royal and local regulation of the grain trade 1500–1660, Colbert's place in the history of the grain trade, and regulation of the domestic grain trade, 1683–1709.

The condition of agricultural production in Argentina, E. A. J. PFANNENSCHMIDT (*Schr. Ver. Sozialpolit., 141 (1913), pt. 1, pp. V+89*).—The author discusses the physical characteristics, immigration, system of land ownership, areas and distribution of the principal crops, cost of producing crops, trade in agricultural products, number of live stock and changes in proportion of those native bred, and the trade in meat products.

Production in the French colonies in 1911–12, E. BAILLAUD (*Inst. Colon. Marseille Notice 10 (1913), pp. VIII+85*).—This report shows by statistical tables the quantity and value of agricultural products imported and exported for practically all the French colonies, as well as the number of live stock in several of the colonies.

[Agriculture in Victoria], A. M. LAUGHTON (*Victorian Yearbook, 33 (1912–13), pp. 619–733, pl. 1*).—Included in this annual statement is a discussion of the following subjects relating to agriculture: Land settlement, irrigation, rainfall, number of holdings by sizes, land occupied and cultivated, number of live stock, number of persons engaged in agricultural pursuits, area and production of farm crops, fertilizers used, machinery and implements on farms, number of dairy cows, butter and cheese made, number of cream separators in use, number of live stock slaughtered, and wool production. In most instances the subjects are accompanied by statistical tables.

Prices and wages in India (*Prices and Wages India, 30 (1913), pp. VI+218*).—Contained in this report are statistical tables showing for 1873 and from 1888 to 1912 the average annual retail prices of the principal farm crops at certain selected districts and stations, wholesale prices of staple articles of import and export at Calcutta and Bombay, and average monthly wages of skilled and unskilled laborers for certain selected districts and stations.

AGRICULTURAL EDUCATION.

Report on agricultural education, L. C. COLEMAN (*Dept. Agr. Mysore, Gen. Ser. Bul. 3 (1913), pp. 72*).—The author gives an account of the systems and methods of secondary, elementary, and popular instruction in agriculture in Germany, Switzerland, England, Canada, the United States, Japan, and the Philippines, the information having been gained by personal visits supplemented by the perusal of literature on this subject. He also discusses the adaptation of some of these agencies and methods of agricultural instruction to conditions in Mysore. Outlines of the courses of study of the Dunn County School of Agriculture, Menomonie, Wis., the La Crosse County School of Agriculture, Onalaska, Wis., and the University of Minnesota School of Agriculture; conclusions of the committee of the National Council of Education on industrial education in schools for rural communities; and the syllabus of the elementary course in agriculture of the committee on instruction in agriculture of the Association of American Agricultural Colleges and Experiment Stations are appended.

Annual report of the director of education [of the Philippines] (*Ann. Rpt. Dir. Ed. P. I., 1913, pp. 149, pls. 22*).—This report shows that in 1912–13 there were 5 agricultural schools (grades 1 to 7, inclusive) with a total enrollment of 287 pupils. All of these schools, except the Central Luzon Agricultural School at Munoz, Nueva Ecija, which is much more advanced and better

equipped, enroll non-Christian pupils only. These schools are boarding schools where pupils are maintained by the government. They had a total area of 984 hectares (2,430 acres) of which 131 hectares were under cultivation. There were also 6 farm schools of intermediate grade (grades 5 to 7, inclusive) with a total enrollment of 633 pupils. Schools of this type must have at least 10 hectares of land and the maintenance of pupils is not provided for. Statistics are also given of the animals and value of products at these schools, as well as of the number of pupils in farming, housekeeping and household arts, settlement farm schools, school and home gardens, school nurseries, and corn contests in the various elementary and intermediate grades of the Philippine schools.

The tropical agricultural college, C. F. BAKER (*Philippine Agr. and Forester, 2 (1913), No. 4–6, pp. 98–103*).—The author discusses the development of tropical agriculture and the organization and mission of the agricultural college in this direction.

Twentieth annual report of the inspector of state high schools of Minnesota (*Ann. Rpt. Insp. State High Schools Minn., 20 (1913), pp. 67, figs. 3*).—This report for the year ending July 31, 1913, shows that there were 94 state high schools which received a total state aid of $133,646 for instruction in agriculture. Agriculture was taught in 123 high schools to 3,631 students, cooking in 130 high schools to 4,795 students, sewing in 154 high schools to 5,637 students. The total expenditure for agricultural equipment was $37,016 and for cooking and sewing equipment $45,020. An outline is given of the home economics instruction, as well as notes on agricultural instruction and statistical tables of enrollment in agriculture and home economics in regular and short courses, expenditures for salaries, real estate, agriculture, home economics, etc., for the high schools receiving state aid for agriculture.

The usual course in agriculture consists of general agriculture taught from an elementary text-book once a week in the seventh and eighth grades, a freshman class in farm crops, and a sophomore class in live stock. A few of the stronger schools have a third and fourth year's work in soils and farm management.

Correspondence courses, O. H. SELLERS (*Tex. Agr. and Mech. Col. Ext. Bul. 9 (1913), pp. 15*).—This is an announcement of general information concerning correspondence courses in agriculture offered by the Texas College.

Report of the bureau of children's school farms for 1912 (*Rpt. Bul. Children's School Farms [N. Y. City], 1912, pp. 20, pls. 12*).—This is a report of the work and influence of the Thomas Jefferson and DeWitt Clinton Park children's school farms in New York City for 1912.

The school as a social center, G. H. EDWARDS, JR. (*Bul. Univ. S. C., No. 35, pt. 2 (1913), pp. 73*).—This is a dissertation on what this movement is, its relation to other social movements, its value and extent in South Carolina, and what should be done in the State. A bibliography is appended.

How can the girls' industrial club work be made a part of the rural school work? SUSIE V. POWELL (*Proc. Conf. Ed. South, 16 (1913), pp. 78–81*).—The following methods are suggested: Examination questions for teachers based on club activities, instruction at normal colleges and summer normals and institutes, demonstration and club meetings at the school, as well as in the homes, cooperation of the county superintendent and his teachers, correlation of the common school studies with club activities as centers of interest, and careful choice of a county supervisor who can procure the cooperation of the rural school teachers.

Boys' agricultural clubs, W. H. KENDRICK (*W. Va. Univ. Agr. Ext. Dept. Circ. 8 (1914), pp. 14, figs. 4*).—The purpose and present status of agricultural

clubs in West Virginia are outlined and directions given for organizing and conducting club work.

[Instructions for boys' and girls' clubs,] J. C. HOGENSON (*Agr. Col. Utah Ext. Div., 1914, Circs. 16, pp. 4; 17, pp. 8, figs. 1; 18, pp. 7; 19, pp. 8*).—Instructions are given for growing sugar beets and tomatoes, raising poultry, bread making, and flower gardening.

Collegiate Country Life Club of America (*Urbana, Ill., 1913, pp. 12*).—The constitution and by-laws of this organization (E. S. R., 29, p. 199) is given.

Country life club, A. W. NOLAN (*Agr. Col. Ext. Univ. Ill. [Circ.], 1913, pp. 15.*)—Outlines are given of the activities of organization of a country life club as a local chapter to the Collegiate Country Life Club of America (see above) and of the constitution and by-laws of boys' and girls' country life clubs.

Agriculture [in Utah high schools] (In *Circular of Information and State High School Course of Study. Salt Lake City, Utah: State Bd. Ed., 1913, pp. 43–52*).—An outline is given of agricultural work for Utah high schools, definitely correlated with the agricultural activities of the neighborhood, and the arrangement and length of courses related to the needs of the community. All high schools outside of cities of the first and second class and mining districts are required to offer one-half unit of elementary agriculture in the first year.

Elementary agriculture (In *Course of Study for the Rural Schools of Kansas. Topeka, Kans.: State Bd. Ed., 1913, pp. 86–97*).—This is an outline in elementary agriculture by months for the eighth grade for the use of Kansas teachers.

Teaching agriculture in rural and graded schools, E. C. BISHOP, R. K. FARRAR, and M. H. HOFFMAN (*Iowa State Col. Bul., 12 (1913), No. 8, pp. 164, figs. 27*).—This bulletin consists of three parts, viz. (1) the correlation scheme and 1-year course of study in agriculture outlined by weeks and months with the topics and subtopics arranged in seasonal and sequential order, and with corn forming the principal topic; (2) development of the topic corn through 42 classroom and field lessons, and (3) supplementary work arranged by months in the study of corn from the standpoint of its final preparation and value as a human food, together with correlation work in agriculture and home economics as related to home and school interests.

Agriculture [in rural land graded schools] (In *State Course of Study for the Rural and Graded Schools in the State of Missouri. Jefferson City, Mo.: State Supt. Pub. Schools, 1913, pp. 101–119, fig. 1*).—Notes and suggestions are given on school garden aims and work, as well as an outline for the study of seeds and corn, corn judging, soils and soil experiments, animal husbandry, seed testing, pruning, chickens, and fruits for the seventh grade, to alternate with the work in farm managament, physiology, and road building outlined for the eighth grade. A list of references is appended.

Corn Day annual for the schools of Illinois, 1913 (*Ill. Dept. Pub. Instr. Circ. 73 (1913), pp. 52, figs. 21*).—This circular outlines lessons on corn, following the sequence of the season from planting to harvest. Each lesson consists of a simple discussion of the subject matter followed by review questions and problems, practical exercises being grouped at the end of the circular.

Foods and household management, HELEN KINNE and ANNA M. COOLEY (*New York, 1914, pp. XV+401, pl. 1, figs. 80*).—This volume is intended for use in household arts courses in high and normal schools, as well as in the home. It treats specifically of foods, their production, sanitation, cost, nutritive value, preparation, and serving, these subjects being closely interwoven with the practical aspects of household management, and they are followed by a study of the household budget and accounts, methods of buying, housewifery, and laundering. It includes about 160 carefully selected and tested recipes, together

with a large number of cooking exercises of a more experimental nature designed to develop initiative and resourcefulness.

The house and the art of living in it, JESSIE CAREY (*Contemporary Rev., 104 (1913), Sept., pp. 395–403; reprinted in Littell's Living Age, 7. ser., 62 (1914), No. 3627, pp. 109–116*).—Methods of housekeeping, household conveniences, and similar topics are discussed, in part on the basis of personal experience.

Principles of bread making, HENRIETTA W. CALVIN (*Oreg. Agr. Col. Bul. 83 (1913), pp. 8*).—This bulletin discusses the qualities and ingredients of good bread, and gives recipes for making bread, rolls, buns, and zwieback.

Principles of cake and jelly making, AVA B. MILAM (*Oreg. Agr. Col. Buls. 84 (1913), pp. 7; 85 (1913), pp. 7*).—The author discusses the various principles involved in the preparation of cake and jelly.

Care of food in the home, DOROTHEA BEACH (*Timely Helps for Farmers [Col. Agr. Univ. Maine], 7 (1914), No. 5, pp. 25–32*).—The author discusses bacteriology, yeasts and molds, and methods of preserving food.

Syllabus of illustrated lecture on the homemade fireless cooker, MRS. K. C. DAVIS and ANGELINE WOOD (*U. S. Dept. Agr., Office Expt. Stas. Syllabus 15 (1914), pp. 15*).—This syllabus, which was prepared for farmers' institute and other extension lecturers, describes a homemade cooking box and discusses its special uses and advantages, the temperature inside the box, cooking different kinds of food in it, devices for keeping liquids hot or cold, and the cooking box as a refrigerator, and gives directions for a demonstration with a box. A list of 36 lantern slides and a list of references to literature on the subject are appended.

The cow, M. J. ABBEY (*W. Va. School Agr., 4 (1914), No. 4, pp. 16, figs. 5; Sup. Chart, figs. 4*).—This article gives directions for using the supplementary unmounted paper schoolroom charts enumerating different breeds of cattle and characteristics of dairy and beef cows, with suggestions on the care and feeding of a dairy cow and on rearing the young calf.

Mann's agricultural bookkeeping instructor, J. D. MANN (*Galena, Ohio, 1914, pp. 55*).—This book is designed for self-instruction and schoolroom use. The transactions employed will be familiar to the ordinary farmer conducting a general or specialized farm or engaged in business such as selling fences, fertilizer, farm implements, etc., and at the same time illustrate the fundamental principles of bookkeeping.

NOTES.

Arizona University and Station.—Dr. R. H. Williams, formerly of the Minnesota University and Station, has been appointed professor of animal husbandry in the university and animal husbandman in the station.

Connecticut Storrs Station.—Leslie E. Card has been appointed assistant in poultry husbandry.

Illinois University and Station.—Louis D. Hall, assistant professor of animal husbandry in the university and assistant chief in animal husbandry in the station, has been appointed specialist in live stock and meats in the Office of Markets of this Department, and has entered upon his duties.

Kansas Station.—Albert G. Hogan, Ph. D. (Yale, 1914), formerly professor of agriculture and chemistry at the Marysville (Missouri) State Normal School, has been appointed assistant in animal nutrition and has entered upon his duties.

Maryland College and Station.—*Science* notes that the extension and demonstration service has been formally organized, with T. B. Symons as director, Nickolas Schmitz as agronomist, W. T. L. Taliaferro in charge of farm surveys and management, G. E. Walcott in charge of dairy extension work, C. L. Opperman poultryman, and Reuben Brigham in connection with publications. The college has been reorganized into the following divisions: Agronomy and animal husbandry, W. T. L. Taliaferro acting dean; applied science, H. B. McDonnell dean; horticulture, T. B. Symons dean; and engineering T. H. Taliaferro dean. Recent promotions include E. N. Cory to be professor of zoology, L. B. Broughton professor of analytical chemistry, and Grover Kinzy associate professor of agronomy and farm machinery.

Michigan College and Station.—Press reports announce the resignation of President J. L. Snyder to take effect June 1, 1915. J. H. Torrence has resigned to engage in commercial work and has been succeeded by O. F. Jensen, a recent graduate of the college.

New York State Station.—Everett P. Reed, a recent graduate of the Ohio State University, has been appointed assistant agronomist.

Oregon Station.—Dr. H. E. Ewing and V. I. Safro have resigned as research assistants in entomology, the latter to accept a commercial position in Louisville, Ky. G. F. Mozette, a 1914 graduate of the college, has been appointed assistant in entomology.

Oklahoma College and Station.—Morrill Hall, the substantial agricultural and administration building erected in 1906 at a cost with equipment of about $75,000, was burned during the night of August 6. A portion of the college records were rescued but practically the entire station property was destroyed, including the stock of bulletins, library, mailing lists, etc. It is understood that the building carried insurance of about $50,000.

Port Rico Federal Station.—José O. Carrero has been appointed assistant chemist beginning July 1.

South Dakota College.—Dr. E. C. Perisho, professor of geology and dean of the college of arts and sciences at the University of South Dakota since 1903 and state geologist, has been appointed president.

Utah Station.—Recent appointments include Ray Smith as superintendent of the substation farm at St. George, and W. E. Goodspeed as assistant horticulturist, succeeding respectively A. B. Ballantyne and H. B. Sweitzer.

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U. S. Department of Agriculture.

EXPERIMENT STATION RECORD.

VOL. XXXI. SEPTEMBER, 1914. No. 4.

The sixth session of the Graduate School of Agriculture was held June 29 to July 24 at the College of Agriculture of the University of Missouri. As heretofore, the School was conducted under the auspices of the Association of American Agricultural Colleges and Experiment Stations, through its standing committee on graduate study. Since its purpose is not only to give advanced instruction in agricultural science but to acquaint investigators with the latest methods employed and results obtained in special research by their fellows in particular fields, the attendance is by no means confined to beginners in agricultural research. Each session finds an increasing number of seasoned scientific workers enrolled for the sake of its associations and its broadening influence as well as for the practical and special benefit to be derived therefrom. The more advanced phases of the work are being more and more accentuated in the successive sessions, and a considerable portion of the information now being offered in the school is not generally accessible elsewhere for some time, if obtainable at all in so effective a form.

The instruction in the Graduate School for this year was conducted along six main lines, each running through the four weeks' session, as experience has demonstrated the advantage of concentrating attention on a limited number of subjects for the entire period. Those included for this session were genetics, agronomy, horticulture, animal husbandry, immunity and disease resistance, and rural economics and sociology, including farm management.

The number of instructors was twenty-nine, with a considerable number of other speakers at the various conferences and other gatherings. Ten of these were members of the faculty of the University of Missouri, and the remainder were specialists from the U. S. Department of Agriculture, various agricultural colleges and experiment stations, the Carnegie Institution of Washington, the University of Edinburgh, and the Imperial Biological Institute at Dahlem, Berlin. Dr. A. C. True of this Office again acted as dean, with Mr. Arthur J. Meyer of the University of Missouri as registrar. The enrollment of students reached one hundred and fifty, representing about thirty States and Territories, besides the District of Columbia, Porto Rico, Canada, and Scotland.

At its public opening exercises, the School was welcomed to the University of Missouri by Dean Walter Williams of the School of Journalism, as the representative of President Hill who was in Europe, and by Dean Mumford of the College of Agriculture. Dean True of the Graduate School briefly outlined its history and pointed out some of the reasons for its continuance. In this connection he directed attention to the fact that "the desirability and importance of such an agency as the Graduate School of Agriculture, which aims to influence the whole movement relating to agricultural education and research by giving it certain impulses from the top, can not be determined by the number of persons who come directly under its influence. They are rather largely to be found in the character and extent of the movement and the tendencies which are developing in it."

Dean True also briefly summarized some of the important developments of American agriculture and agricultural education and research during the twelve years since the establishment of the Graduate School. Census comparisons of conditions in 1900 and 1910 were quoted, showing an increase in the proportion of improved lands from 49.4 to 54.4 per cent, an increase of land values of 118 per cent, and an increase in the proportion of the total farm investment represented by land from 63.9 to 69.5 per cent. Under these conditions "the farmers, with land much higher in price, are loudly calling for increased knowledge of ways to use their land more economically and with greater returns. But this knowledge can only be obtained by more highly trained men, for the remaining agricultural problems are complex and difficult to solve."

Meanwhile boys from both country and city have been going to agricultural colleges in much larger numbers. During the past decade the number of students taking the full four-year course in agriculture has increased from approximately 2,500 to 12,500, or an increase of 500 per cent. The number of white students registered in short and special courses has doubled, now aggregating about 11,000. Since 1910, the annual number of graduates in agriculture has increased from 708 to 1,384, and the number receiving advanced degrees from 74 to 164. The total revenues of the land-grant colleges have practically tripled and those of the experiment stations have more than tripled, the increase being especially notable from sources other than federal funds. Similarly the number of men on the staffs of the experiment stations has increased from about 750 to approximately 1,600, and the number of these doing no teaching from 375 to 925.

Along with the increase in the activities of the experiment stations and the number of students taking the college courses in agriculture, the number of secondary schools in which agriculture is

taught has vastly increased. In 1903, very few secondary schools were giving instruction in agriculture. At present there are over 2,000.

Ten years ago there was scarcely any agricultural extension work performed outside of the work carried on by the farmers' institutes. To-day there are 1,300 men employed as state, district, and county agents, and as boys' and girls' club workers. The money appropriated under the Smith-Lever Act alone will call for at least 2,500 men for extension work in the next ten years. Even if this number is employed in addition to those already in the field, to reach all the farm operators each extension worker will have to come in contact with at least 2,500 farm operators a year, or over 4,000 farm or agricultural workers.

There are also over seven hundred positions in the U. S. Department of Agriculture for which graduation at an agricultural college is a prerequisite, and doubtless there are many other positions in which the Department would use graduates of agricultural colleges if these colleges were giving more highly specialized and advanced courses of instruction in agricultural lines. As it is, the Department is now often compelled to take men who are well trained in chemistry or biology and give them the special training along agricultural lines required by the work in which they are engaged.

"How different, then, is the condition of these colleges from what it was even twelve years ago! Then they were just beginning to feel the impulse of a more prosperous agriculture and the turn of the tide of popular sentiment in favor of agricultural education. Now they are at a flood tide of popular favor, which is even so strong as to threaten to sweep them from safe moorings. The demand for trained men on the farms and in commercial pursuits allied to agriculture is more than keeping pace with the increase of students and graduates, and is even depleting the faculties of the agricultural colleges. To this must now be added the very large demand for agricultural graduates in extension work. . . .

"Is it any wonder that the friends of higher education and research in agriculture are perplexed and troubled? How shall we meet the incessant demand for agricultural graduates in practical life and in extension work and at the same time strengthen and increase the facilities of our agricultural colleges and the staffs of our experiment stations and great Department of Agriculture? To have well-trained men on our farms and to carry practical information to the multitudes of our farmers is tremendously important. But where are we to get in sufficient numbers the highly trained and efficient college professors who are to teach the thousands of students in our colleges and whence are to come the elaborately equipped men of sufficient originality to conduct thorough and successful researches

in agriculture in order that we may have an adequate fund of knowledge for the use of the college teachers, extension workers, and farmers?

"Evidently the compensations of the trained farmers and extension men in the way of incomes and popular favor are going to be relatively large. Will these occupations, therefore, take our brightest and most capable students and leave the professorships and research positions to be filled by second-rate men? This will depend very largely on the spirit of the men best qualified to be professors and investigators and on the attitude of the universities, colleges, stations, and Department of Agriculture toward such men. . . .

"If we are to have great scholars in agriculture, as we have had them in philosophy or astronomy, we must have men who, having weighed carefully the advantages of commercial success and popular favor, nevertheless decide that they can find their greatest satisfaction only in the attainment of the most profound scholarship through study and research in agricultural lines. Thus they will be unmoved by flattering offers to go out into the broad world of affairs and steadily pursue the scholar's business in laboratory, library, and classroom whatever happens outside the college campus.

"And we must have college boards and presidents and deans who will have a great appreciation of the value of the great scholar in agriculture and will show this in a substantial way by creating for him a sympathetic environment, and favorable conditions for his work. Even his salary should show some indication of appreciation of his merit. There should be financial rewards for great scholars in the universities and colleges, as well as for able administrators. Above all the atmosphere of the agricultural college should be favorable to learning and research. . . . It should be broadly sympathetic with the men and women on the farms and their immediate problems, but it should also be highly stimulative and encouraging to the scholar who desires to get beneath the surface of things, to know and discover causes that he may be the better able to remedy ills, or devise improvements in practice.

"To encourage high standards and attainments in agricultural scholarship is the main purpose of this Graduate School of Agriculture. It does not attempt to take the place of regular graduate courses in agriculture, which happily are now being maintained at a number of our strongest agricultural colleges. Its aim is rather to promote the wider establishment and greater efficiency of such courses.

"By bringing graduate students together from different points of the United States and some foreign countries and giving them personal contact for a month with eminent experts in agricultural and related sciences, this School hopes to awaken in many of its students

a desire for advanced study which will not be satisfied except by realization. By personal touch with students and experts from widely different regions it is hoped that each student will get a broader and clearer vision of the possibilities in agricultural study and research. Returning to the institutions from which they come it is expected that they will exert a broader influence in raising the standards and expectations of agricultural education and research throughout the United States."

The central feature of the 1914 session was a course in genetics, comprising forty lectures and twelve seminars, which was planned to give a systematic presentation of the present status and outlook of this subject, with special reference to its agricultural relations. This was in response to a somewhat general demand that more comprehensive instruction in at least one subject should be given at the Graduate School. For this purpose the number of lecturers was kept down to four and there was a definite prearrangement regarding the field each lecturer was to cover. The subject chosen was presumably interesting to all students of agricultural science and therefore the hours were so arranged that all members of the School could attend. The course proved very successful and will encourage the development of more definite instruction at future sessions.

This course was opened by Dr. J. A. Harris of the Station for Experimental Evolution of the Carnegie Institution of Washington, who presented the statistical groundwork for research work, including methods of calculation and illustrations of the practical applications of statistical formulas in genetic studies. Prof. M. F. Guyer, of the University of Wisconsin, discussed the physical basis of heredity, including the development of the body and the germ plasm; the chromosomes as related to heredity in the light of Mendelism; sex in relation to heredity; and the ultimate nature of the germ plasm. An account of some pedigree culture investigations and their results as bearing upon heredity and development in plants and as related to Mendel's law was presented by Prof. E. M. East, of Harvard University. Blending inheritance and its interpretation was discussed, as was also the possible application of the present knowledge of heredity to breeding problems and practice. In conclusion, Prof. A. D. Darbishire, of the University of Edinburgh, Scotland, presented results of an attempt to estimate the value of the Mendelian method as an instrument for the improvement of the animals and plants which are serviceable to mankind, discussing the method as applied to practical breeding, and giving illustrations of its application to the improvement of wool and milk. He also developed the philosophical relations of the Mendelian theory in its broader aspects as affecting our conceptions of heredity and of life in general. This was done in a very original and interesting way and drew the atten-

tion of the university community at Columbia, as well as of the members of the Graduate School.

The course in agronomy dealt with special problems in the breeding and nutrition of field crops, with reference to conditions in both humid and arid regions. Dr. H. L. Shantz, of the Bureau of Plant Industry, considered the relation of moisture supply to plant development, and Director C. E. Thorne, of the Ohio Experiment Station, some of the practical aspects of soil fertility investigations. Other factors in crop production were treated by Prof. C. V. Piper, of the Bureau of Plant Industry, and Dr. L. H. Smith, of the University of Illinois, the former dealing especially with the climatic, soil, and biological adaptations of forage plants and the origin of crop varieties, and the latter discussing crop improvement through selection in corn and other cereals.

The work in animal husbandry was largely a presentation of important methods and results connected with the investigations which have been in progress for a number of years at the Missouri Experiment Station. Prof. C. H. Eckles gave the results of studies with dairy cattle, including factors influencing growth, milk secretion, and the composition of milk and milk fat, and the development and composition of the fetus. Dean Mumford discussed age as a factor in animal breeding and the growth curves of animals on different planes of nutrition. H. O. Allison reported on cattle feeding experiments, including nutrition studies on beef-breeding cows. Dr. P. F. Trowbridge discussed the composition of beef animals, changes during growth, fattening and starvation, variations in adipose tissue, and the digestion factors. The account of the Missouri work was appropriately supplemented by discussions based especially on the extensive investigations in animal chemistry conducted by Dr. H. S. Grindley at the Illinois Station. He pointed out the relation of his work and that of other investigators to special problems in animal nutrition such as the specific effects of feeds or rations, particularly protein, upon the nutrition of animals, changes in the animal body during growth, feeding experiments, and the digestibility of feeds and rations.

In the course in horticulture, Prof. J. C. Whitten, of the University of Missouri, reported upon the influence of high-producing and low-producing parent fruit trees upon progeny propagated by bud selection, the influence of the season of transplanting upon the development of fruit trees, and an investigation of factors affecting hardiness. Prof. W. L. Howard, of the same institution, considered the rest period as related to hardiness and some physiological changes accompanying the breaking of the rest period. Prof. H. J. Eustace, of the Michigan Agricultural College, discussed horticultural crop regions of the United States, the holding, moving, and storing of

horticultural products, and fruit selling. E. J. Kraus, of the Oregon Station, reported on the horticultural organization in the Pacific Coast Northwest, orchard economics, the relation of soil moisture to fruit production, and pollination in pomaceous and drupaceous fruits. U. P. Hedrick, of the New York State Station, took for his subjects fertilizers for fruits, the soil treatment of orchards, stocks for fruit trees, orchard ecology, and fruit breeding from the horticulturist's standpoint.

In the course in immunity and disease resistance, an attempt was made to bring the students of plant and animal diseases together to consider some of the general principles underlying this subject and to compare the relative advances made on its plant and animal sides. V. A. Moore, director of the New York State Veterinary College, of Cornell University, reported upon the phenomena of infection and variations in the manifestation of specific diseases, immunity and vaccination, and vaccine therapy. Prof. J. W. Connaway, of the University of Missouri, gave five lectures on immunity and disease resistance in animals. Prof. G. M. Reed, also of Missouri, discussed the influence of external factors on immunity and susceptibility, biologic forms in powdery mildews and rusts, and bridging species. Prof. L. R. Jones, of the University of Wisconsin, discussed problems of immunity and morphological characters of the hosts, theories of immunity, and their possible application, and W. A. Orton, of the Bureau of Plant Industry, the evolution of disease resistance and practical results obtained from a study of the disease resistance factor in general plant breeding.

Taking advantage of the presence in this country of Geheimrat Regierungsrat Dr. Otto Appel of the Imperial Biological Institute at Dahlem, Berlin, Germany, the School was favored with two lectures by him, presenting results of the latest investigations on diseases of potatoes and cereals, and discussing the control of disease through seed certification. Director Moore also, by special request, gave a lecture on bovine tuberculosis, its nature, symptoms, and relation to man.

As at previous sessions, there was general interest in the course on rural economics. Prof. T. N. Carver, of Harvard University and the Rural Organization Service of this Department, under the general head of Organization of Rural Interests discussed marketing and purchasing, rural finance and accounting, communication, education, sanitation, recreation, and beautification. President K. L. Butterfield, of the Massachusetts Agricultural College, took up rural institutions and the community idea and plan, community relationships, and rural leadership, and Prof. S. D. Gromer, of the University of Missouri, the problem of rural tenancy. Along the lines of farm management, E. H. Thompson, of the Bureau of Plant Industry,

gave some results of farm enterprise and management surveys and cost accounting investigations, discussing problems peculiar to certain sections and some profitable types of farming, and O. R. Johnson, of the University of Missouri, discussed the use of the farm diary, giving results of some studies of farm records and surveys.

Some special problems of rural communities in different parts of the country and the relations of the Department of Agriculture to the State agricultural colleges and local organizations in the development of extension work were discussed at evening and Saturday conferences. Methods of instruction relating to soils and crops, the vexed question of requirements in farm practice in college courses in agriculture, the work of traveling professors in Europe, and the relative conditions of agricultural research in Europe and the United States were also considered at these conferences.

Taken as a whole the work of this session of the Graduate School was more generally of a kind and grade appropriate to such a school and the students were more generally such as could appreciate and profit by graduate instruction than ever before. The interest and attendance were maintained to an unusual extent until the close of the session.

The problem of securing a larger representation of States and institutions at this School is evidently not solved. The great increase of summer work in the agricultural colleges and experiment stations is keeping many away. The fact that in many cases attendance at the Graduate School would practically cut off the annual vacation, so much needed by busy workers in these institutions, deters others from coming. It is therefore necessary still to urge that the managers of the institutions from which most of the students at the Graduate School must be drawn would do well to consider more seriously the advisability of more definite and liberal encouragement of attendance on the part of their faculties. An arrangement by which at least three or four men from each college would be enabled to attend each session would greatly enhance the benefits which the agricultural colleges throughout the country might derive from this School.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Organic chemistry. H. D. HASKINS (*New York and London, 1913, 2. ed., pp. XIII+430, figs. 25*).—The second edition of this work, which is intended for medical, pharmaceutical, and biological students, contains practical exercises and some portions of physical chemistry in addition to the organic chemistry. It is the belief of the author that an organic chemistry text-book designed for the use of medical students should consider all the organic compounds of importance that enter into the study of physiology, biochemistry, and pharmacology.

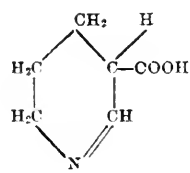
Theories of solutions. S. ARRHENIUS (*New Haven, Conn., and London, 1912, pp. XV+247, figs. 6*).—These are lectures on theories of solutions delivered at Yale University during the spring of 1911 under the Mrs. H. E. Silliman foundation, as follows: Short history of the theory of solutions; the modern molecular theory; suspensions; the phenomena of adsorption; the analogy between the gaseous and the dissolved state of matter; development of the theory of electrolytic dissociation; velocity of reactions; conductivity of solutions of strong electrolytes; equilibriums in solutions; the abnormality of strong electrolytes; and the doctrine of energy in regard to solutions.

Some further contributions to simple plant bases. G. TRIER (*Hoppe-Seyler's Ztschr. Physiol. Chem., 85 (1913), No. 5, pp. 372–391*).—The betains are regarded as the simplest alkaloids formed from amino acids by exhaustive methylation.

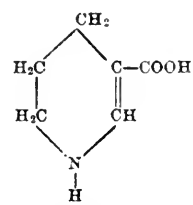
In this work glycin (glycocoll), betain, and cholin were isolated from an alcoholic extract of oat farina. In the phosphatids from oats amino-ethyl alcohol (colamin) was noted but no betain. The amino alcohol was found to react quantitatively with nitrous acid and can be determined in this way. Colamin was precipitated by phosphotungstic acid.

In areca nuts secondary bases were studied, and after the removal of the arecolin the bases were freed from cholin.

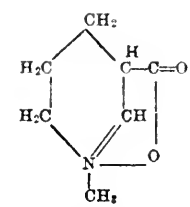
The following formulas, which differ from those suggested by Jahns, are proposed:



Guvacin
$C_6H_9NO_2$.



Isoguvacin
$C_6H_9NO_2$.



Arecain
$C_7H_{11}NO_2$.

About betonicin and turicin. A. KÜNG and G. TRIER (*Hoppe-Seyler's Ztschr. Physiol. Chem., 85 (1913), No. 3, pp. 209–216*).—The betain mixture obtained from *Betonica officinalis* was resolved into two isomeric bases, one levorotatory

and the other dextrorotatory. The name betonicin (E. S. R., 28, p. 312) is retained for the former and turicin is the suggested designation for the latter. Both must be regarded as betains of natural oxyprolins.

Exhaustion methylation of oxyprolin ($[a]D = -81.04°$) yielded the same right and left rotatory betains as occur in *B. officinalis*. According to the method of isolation, sometimes one and sometimes the other isomer has been isolated, but in reality, according to the authors, both of these betains are present in the plant.

A description of the properties of betonicin and turicin follows.

Synthesis of betonicin and turicin, A. KÜNG (*Hoppe-Seyler's Ztschr. Physiol. Chem., 85 (1913), No. 3, pp. 217–224*).—The gamma-hydroxyprolin from gelatin, prepared by Fischer's method, when methylated with potassium hydroxid in methyl alcohol and methyl iodid yields hydroxyprolin betain. This is a mixture of equal quantities of betonicin and turicin.

Gentiobiose, G. ZEMPLÉN (*Hoppe-Seyler's Ztschr. Physiol. Chem., 85 (1913), No. 5, pp. 399–407*).—Octacetylgentiobiose, which has a high melting point, is not rapidly soluble but crystallizes with ease in a pure state.

These experiments show that acetylization may be conveniently employed to obtain gentiobiose from plant products, especially gentian root. Octocetylgentiobiose, isolated from purified preparations, consisted of almost colorless, silk-like, slender needles and these sintered at 186° C. and melted at 193°. The optical rotation in chloroform at 20° was −5.3.

Octacetylgentiobiose, prepared from strongly contaminated materials (gentian extract or aqueous alcoholic extract of gentian, sintered at 192° and melted at 195°. It was easily soluble in chloroform, acetone, hot benzol, hot acetone, and hot alcohol, slightly soluble in cold alcohol and ether, and almost insoluble in petroleum ether and in hot water. It was more soluble in dilute than in absolute alcohol. Its rotation at 20° was −5.6.

Free gentiobiose reduces 130 cc. of Fehling's solution per gram while maltose requires 128.5 cc. and cellobiose 153 cc. The phenylosazone was in the shape of lemon-yellow stellate needles and when obtained from hot water they were short-pointed prisms. The melting point was between 160 and 170°.

Enzyms in the leaves of Salix caprea, I. BOLIN (*Hoppe-Seyler's Ztschr. Physiol. Chem., 87 (1913), No. 3, pp. 182–187*).—The possibility exists that the leaves of *Salix caprea* contain at least three glucosid splitting enzyms, a salicase, an amygdalase, and a β-glucosid-splitting enzym. Salicase is considered specific for salicin and is not active toward β-methyl glucosid. The enzym which acts upon β-methyl glucosid was noted in the leaves in 1911 but not in those from the same tree in 1912.

The partial hydrolysis of cellulose, G. ZEMPLÉN (*Hoppe-Seyler's Ztschr. Physiol. Chem., 85 (1913), No. 3, pp. 180–191*).—By treating cellulose with concentrated sulphuric acid, products were formed which did not contain cellobiose complexes. Even when this treatment was prolonged, cellobiose acetate was produced on acetolysis and not dextrose pentacetate. Xylan preparations from locust wood, mannan from the seeds of *Phytelephas macrocarpa*, and chitin when partly hydrolyzed gave unsatisfactory amorphous products.

The fermentation of cellulose by thermophilic bacteria, H. PRINGSHEIM (*Centbl. Bakt. [etc.], 2. Abt., 38 (1913), No. 21–25, pp. 513–516, fig. 1*).—The bacteria were obtained either from soil or manure. From 3 gm. of cellulose 0.2125 gm. of formic acid, 1.15 gm. of acetic acid, and a very small amount of lactic acid were produced. The remainder of the material was converted into hydrogen and carbon dioxid.

Constituents of apples. C. THOMAE (*Jour. Prakt. Chem., n. ser., 87 (1913), No. 3, pp. 142–144; abs. in Jour. Chem. Soc. [London], 104 (1913), No. 605, I,*

pp. 327, 328).—The compound previously noted (E. S. R., 26, p. 208), which melts at over 200° C., can be separated by treatment of the apple skins with ether into an insoluble substance "of high melting point, and a waxy substance crystallizing in needles, melting point 68.5°. On distillation under diminished pressure, the oil obtained by extracting the skins with ether yields a crystalline substance of low melting point having an odor of apples and a yellow oil which readily solidifies. The behavior of the skins on distillation is also described."

The study of the ripening of fruit, A. Contino (*Staz. Sper. Agr. Ital., 45 (1912), No. 5–6, pp. 460–472; abs. in Chem. Abs., 7 (1913), No. 19, p. 3373).*—"Kaki plums were used. One sample was analyzed immediately; the second sample was kept in air 1 month; the third sample was preserved in paraffin. Results showed that the second sample had lost in weight through respiration. The constituents, however, remained the same as in the sample preserved with paraffin, except in the case of pectins, of which the third sample contained three times as much as the second sample. The formation of pectins, therefore, has nothing to do with the atmospheric oxygen but is brought about by the internal decomposition of the tannin. The fruit contained no sucrose."

The constituents of hops, F. B. Power, F. Tutin, and H. Rogerson (*Jour. Chem. Soc. [London], 103 (1913), No. 609, pp. 1267–1292).*—The material used in this investigation consisted of good Kentish hops, harvested in 1911. The air-dried hops contained 10.48 per cent of moisture, 2.4 per cent of tannin, and 7.919 per cent of ash.

The work emphasizes the fact that the bitterness of hops is not due to a single substance but to a number of products, some of these soluble in alcohol and others soluble in water. One of these, which was a well-defined, crystalline, bitter substance, termed humulol, $C_{17}H_{15}O_4$, was isolated from the resin. It is phenolic in character, melts at 196° C., is fawn-colored, and on hydrolysis with potassium hydroxid yields among other products an acid, $C_{15}H_{14}O_5$, melting point 210°, and p-hydroxybenzaldehyde. Another crystalline compound, designated as xanthohumol, $C_{13}H_{14}O_3$ (melting point 172°), which is tasteless and possesses an orange-yellow color, was also isolated.

That hops contain a yellow coloring matter resembling quercitrin and myricylpalmitate could not be confirmed. It is shown that the alcoholic extract, which consisted of a dark green, oily resin (equivalent to 14.1 per cent of the weight of the hops), contained "ceryl alcohol, $C_{27}H_{56}O$, hentriacontane, $C_{31}H_{64}$; a phytosterol, $C_{27}H_{46}O$; a phytosterolin (phytosterol glucosid), $C_{33}H_{56}O_6$; a mixture of volatile fatty acids, consisting of formic, acetic, butyric, and valeric acids, together with a hexenoic acid, $C_6H_{10}O_2$ (boiling point 204 to 208°), which was identified as B-isopropylacrylic acid, and apparently a little nonoic acid, $C_9H_{18}O_2$, was also present; saturated and unsaturated nonvolatile acids, comprising palmitic, stearic, and cerotic acids, and an acid, $C_{20}H_{40}O_2$ (melting point 62.5 to 63°), which is apparently an isomerid of arachidic acid; furthermore, cluytinic acid, $C_{21}H_{42}O_2$ (melting point 69°), the methyl ester of which melts at 47°, and linolic acid."

"From the portion of the extract which was soluble in water there were isolated small amounts of cholin, $C_5H_{15}O_2N$, and l-asparagin, $C_4H_8O_3N_2$, both of which had previously been observed to be present, although no evidence of the identity of the last-mentioned substance appears to have hitherto been recorded. The aqueous liquid also contained, besides tannin, a quantity of potassium nitrate and a sugar which yielded d-phenylglucosazone (melting point 208°), together with dark-colored, amorphous material which possessed an intensely bitter taste. A volatile base, having a conin-like odor, was also obtained, but the amount was so extremely small that it could not be further characterized."

Formation of fat in oleaginous fruits.—IV. Formation of fat in Phillyrea media, F. Scurti (*Ann. R. Staz. Chim. Agr. Sper. Roma, 2. ser., 6 (1913), No. 1, pp. 29–37; abs. in Jour. Soc. Chem. Indus., 32 (1913), No. 10, p. 542*).—The results obtained were analogous to those previously noted (E. S. R., 29, p. 201).

In the Phillyrea the fatty acids present are oleic, palmitic, and stearic, and the waxy alcohol from which they originate is fillirol. The latter melts at 290–295° C. and has the same composition ($C_{31}H_{50}O_3$) as oleanol and ligustrol. The fatty substances extracted by petroleum ether from the fruits had an acid number of 25.6 and saponification number of 172.2. The amount of petroleum extract present was 11.93 per cent when calculated on a dry basis.

Formation of fat in cork.—V. Cork from the elder (Sambucus nigra), F. Scurti (*Ann. R. Staz. Chim. Agr. Sper. Roma, 2. ser., 6 (1913), No. 1, pp. 39–52; abs. in Jour. Soc. Chem. Indus., 32 (1913), No. 10, p. 542*).—The methods used for this work were similar to those employed in previous investigations. In the cork a waxy alcohol melting at 278–280° C. and of the same composition ($C_{31}H_{50}O_3$) as those noted in the olive, Japanese privet, etc., was present. The substance has been described as cerin by other investigators.

Formation of fat in cork.—VI, Researches on the leaves of elder (Sambucus nigra), F. Scurti and G. Tommasi (*Ann. R. Staz. Chim. Agr. Sper. Roma, 2. ser., 6 (1913), No. 1, pp. 53–59; abs. in Jour. Soc. Chem. Indus., 32 (1913), No. 10, p. 542*).—"The portion of the ether extract soluble in petroleum spirit contains stearic acid and other fatty acids which have not been identified. In plants (olive, Japanese privet) of the order Oleaceæ the waxy alcohol is formed in the leaves of the plant, but its transformation into fatty acids takes place almost entirely in the fruit. In the elder, on the other hand, which belongs to the order Caprifoliaceæ, the formation of the waxy alcohol and its transformation (to a considerable extent) into fatty acids both take place in the leaves."

Formation of fat in cork.—VII, Fellonic acid of Kügler, F. Scurti and G. Tommasi (*Ann. R. Staz. Chim. Agr. Sper. Roma, 2. ser., 6 (1913), No. 1, pp. 67–75*).—The constituent of cork designated as fellonic acid by Kügler was isolated and identified as a-hydroxybehenic acid ($C_{22}H_{44}O_3$).

The chemical composition of cork substance, G. Zemplén (*Hoppe-Seyler's Ztschr. Physiol. Chem., 85 (1913), No. 3, pp. 173–179*).—Cork substance, isolated by the methods employed for isolating cellulose, when judged by its appearance and solubility is very similar to cellulose but when acetylized does not yield cellobiose acetate.

Cork flour contains in 100 gm., water 6.21, ash 4.12, alcoholic extract obtained after 2 hours 10.5, fatty acids obtained from the alcoholic extract by saponification with alcoholic potassium hydroxid 19, an extract (nonreducing) obtained by a second extraction of the cork residue with alcohol for 3 hours 13.5, a watery extract obtained by extraction for 1 hour on the water bath 14 (the watery solution, when hydrolyzed with normal surphuric acid yielding 1.24 gm. of a substance calculated as d-glucose), and a 1.5 per cent sulphuric acid extract which showed 1.5 gm. of sugars calculated as d-glucose. The amount of residue remaining after extraction was 24.5 gm. and from this 4.17 gm. of a cellulose-like but not identical product was obtained by hydrolyzation with the Bevan and Cross chlorin method.

The cork used in the experiments was of good quality, and was obtained from Portugal.

Methods for the biochemical examination of soils, J. Stoklasa (*X. Cong. Internat. Agr. Gand, 1913, Sect. 2, Question 3, pp. 14*).—The biological phenomena in the soil are dependent upon climatic factors, the physical and

chemical make-up of the soil, the composition of the soil air, the temperature, the time of year, and the animal and vegetable life contained therein. Methods are briefly discussed under the headings of hygroscopically and mechanically absorbed water in soil; water capacity; water vapor and oxygen in the soil air; air capacity of the soil; whether the organic substance of the soil will serve as a good source of carbon for heterotrophs; the respiratory intensity of soil bacteria, and the cleavage of organic substances in the soil; anaerobic and aerobic respiration of bacteria in the soil; nitrogen requirements of soil micro-organisms; oxidation processes of nitrogenous substances in the soil; putrefaction of nitrogenous organic substances by anaerobic organisms; a biochemical method for determining available phosphoric anhydrid and potassium oxid in the soil; bacteriological soil examinaton; cellulose-destroying power of the soil; detection of bacteria which decompose carbohydrates in the soil; soil catalase; and biological absorption of the soil. In some cases the interpretation of the results obtained on the basis of the above methods is described.

A full account of the methods mentioned has been previously presented by Abderhalden (E. S. R., 27, p. 107).

Estimation of total carbon in soils. M. E. Pozzi-Escot (*Bul. Assoc. Chim. Sucr. et Distill., 30 (1913), No. 10, pp. 618–621; abs. in Jour. Chem. Soc. [London], 104 (1913), No. 609, II, p. 622*).—In this method a quantity of soil containing not more than 0.3 gm. of organic matter is mixed in a nickel boat with 0.1 gm. of fused potassium bichromate and 1 gm. of lead chromate, and the combuston conducted in the usual manner.

It is necessary to employ a large excess of oxygen, but the rate at which this gas is passed through the combustion tube must be slow. It is advisable to pack the tube with copper oxid in the form of threads for a length of at least 350 mm. and the copper foil usually employed may be replaced by silvered pumice. The carbon dioxid formed is absorbed in a suitable apparatus and weighed.

The author criticizes the method described recently by Grégoire (E. S. R., 28, p. 708).

Estimation of carbon and carbon dioxid. A. Grégoire, J. Hendrick, E. Carpiaux, and E. Germain (*Ann. Chim. Analyt., 18 (1913), No. 1, pp. 1–8, fig. 1; abs. in Jour. Chem. Soc. [London], 104 (1913), No. 605, II, p. 243*).—The method proposed has been previously described (E. S. R., 28, p. 708).

The application of Folin's method for the determination of ammonia to fertilizers. O. Folin and A. W. Bosworth (*Jour. Indus. and Engin. Chem., 5 (1913), No. 6, p. 485*).—This method (E. S. R., 24, p. 703) is now recommended for determining ammonia in fertilizers in lieu of the magnesium oxid method, as follows:

"Two gm. of fertilizer is placed in a 100 cc. graduated flask, about 50 cc. of water added, and then 25 cc. of approximately normal hydrochloric acid. The volume is now made up to 100 cc. with water, the contents of the flask are shaken, and after standing a few minutes are shaken a second time. The flask is now allowed to stand until the heaviest of the undissolved particles have settled. Five cc. of the supernatant liquid is withdrawn by means of a pipette (filtering is not necessary) and transferred to the tube of the Folin apparatus. Two cc. of a saturated solution of potassium oxalate, a few drops of kerosene, and finally 2 cc. of a saturated solution of potassium carbonate are added. The apparatus is immediately closed and air passed through for 10 to 20 minutes. The ammonia is collected in a flask or test tube which contains 20 cc. of seventieth-normal hydrochloric acid. If the air current is produced by a blast the ammonia is collected in a flask and 25 cc. of water is added to

the 20 cc. of acid in order to increase the volume and thus prevent the loss of ammonia.

"After the distillation, the contents of the flask, or test tube, are titrated back with seventieth-normal sodium hydroxid, using alizarin red as indicator. The percentage of nitrogen as ammonia is found by subtracting the number of cubic centimeters of alkali used from the number of cubic centimeters of standard acid used, and dividing the difference by 5."

The method as given has been tried on 22 samples of fertilizers.

Estimation of water-soluble phosphoric acid in ammonium superphosphates, E. Büttner (*Chem. Ztg., 37 (1913), No. 66, p. 662; abs. in Jour. Chem. Soc. [London], 104 (1913), No. 609, II, p. 621*).—About 0.5 per cent more water-soluble phosphoric acid may be obtained when ammonium superphosphate is shaken for 30 minutes with water at a temperature of 18 to 20° C. than when the temperature is allowed to fall to 16° during the shaking process. The solubility also increases with the fineness of the superphosphate.

The determination of phosphoric acid in Thomas slag powder, M. Popp (*Ztschr. Angew. Chem., 26 (1913), No. 71, Aufsatzteil, p. 480*).—The results obtained with the Lorenz method agreed with those given by the magnesium precipitation method only when the solution contained large amounts of calcium. Evidently a compensation occurs between the calcium and phosphoric acid. If twice the amount of citrate solution is used, low results are found. Magnesium is also easily precipitated and consequently no uniform ammonium magnesium phosphate is obtained. Satisfactory results are obtained only when the phosphoric acid is precipitated under identical conditions.

The work emphasizes the fact that the citrate magnesium phosphate method is a compensation method. When the results agree with those found by the Lorenz method it is an indication that the latter is yielding low results.

The rapid estimation of magnesia in limestone by means of the hydrogen electrode, J. H. Hildebrand and H. S. Harned (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 1 (1912), Sect. I, pp. 217–225, figs. 3; abs. in Jour. Chem. Soc. [London], 104 (1913), No. 610, II, p. 727*).—The method is based on the fact that if normal alkali is added to a solution consisting of calcium and magnesium chlorids, the magnesium is precipitated first and the end point is observed by a further rise in potential.

The apparatus required is shown in the original.

The hydrolysis of levulosans and its application to plant analysis, P. L. de Vilmorin and F. Levallois (*Bul. Soc. Chim. France, 4. ser., 13 (1913), No. 13, pp. 684–691; abs. in Jour. Chem. Soc. [London], 104 (1913), No. 610, II, p. 736*).—This is a study of the behavior of inulin toward hydrolyzing agents.

The use of sulphosalicylic acid (0.72 to 4.3 gm. per liter) at a temperature of 80 to 100° C. is recommended. The acid has no effect on the subsequent estimation of the reducing sugars by Fehling's solution. Sulphuric and oxalic acids are said to give figures which are too variable. Acetic acid in concentrations of from 3 to 10 per cent and hydrolyzing at 80° gives fairly concordant results, but the acid and its salts interfere with the subsequent determination of the sugars.

The anatomical structure of some foreign pod fruits, M. Kondo (*Ztschr. Untersuch. Nahr. u. Genussmtl., 25 (1913), No. 1, pp. 1–56, figs. 40*).—This is a description of the gross and minute anatomy of *Glycine soja, Dolichos melanophthalmus, Vigna sinensis, D. lablab, Canavalia ensiformis, Lathyrus sativus*, and *Cicer arietinum*. An analytical key is included.

About the nature and significance of the quantitative precipitin reaction in honey examinations, J. Thöni (*Ztschr. Untersuch. Nahr. u. Genussmtl., 25 (1913), No. 8, pp. 490–493*).—The precipitin reaction (E. S. R., 28, p. 22) was

found to differentiate real from spurious honey and further to determine the extent to which a honey has been adulterated. The author, however, does not wish to imply that all other methods suggested for honey examination should be eliminated.

The method has not generally been employed in food-control work except at the Swiss food-control stations, but this is probably due to the difficulty experienced in obtaining the antiserum and normal rabbit serum. For the purpose strong antisera are necessary.

The method of conducting the test is described in detail.

In regard to foreign honeys, K. LENDRICH and F. E. NOTTBOHM (*Ztschr. Untersuch. Nahr. u. Genussmtl., 26 (1913), No. 1, pp. 1–11*).—Analyses are given of honeys gathered in France, Italy, Hawaii, the United States, Mexico, Jamaica, Guatemala, Cuba, Haiti, Santo Domingo, Peru, Chile, and Australia. The results are compared with German honeys.

About Fiehe's reaction, J. GERUM (*Ztschr. Untersuch. Nahr. u. Genussmtl., 26 (1913), No. 2, pp. 102–104*).—Some samples of German honey give an orange or reddish yellow coloration with Fiehe's test. This is not due to the presence of invert sugar but rather to the presence of waxy substances in the honey. If such a reaction is obtained, it is advisable to extract a large quantity of honey with ether and then evaporate the extract and examine for the presence of beeswax.

About free and fixed lactic acid in grape and fruit wines, T. ROETTGEN (*Ztschr. Untersuch. Nahr. u. Genussmtl., 26 (1913), No. 11, pp. 648–650*).—An attempt to simplify existing methods, especially Kunz's, for determining lactic acid in wine and also to note whether the lactic acid extractable by ether represents the free acid present.

The results show that the free lactic acid can be easily extracted by the method prescribed. Grape wine contains only free lactic acid, while apple, pear, and other fruit wines contain both fixed and free lactic acid. Although fruit wines yield only a part of their free acid to ether, the possibility still exists for using a procedure of this kind for determining the addition of fruit wine to grape wine.

Sugar analysis, F. G. WIECHMANN (*New York and London, 1914, 3. ed., pp. XIII+307, figs. 7*).—This is the third edition of this work and has been entirely rewritten.

Examination of sugar-beet chips for the addition of molasses, R. WOY (*Ztschr. Öffentl. Chem., 19 (1913), No. 9, pp. 168, 169; abs. in Ztschr. Angew. Chem., 26 (1913), No. 92, Referatenteil, p. 699*).—The addition of molasses to beet chips can be easily recognized by the odor of the feed. If the chips, after maceration with water, are acidified with phosphoric acid and then heated, a disagreeable odor is evolved which can be noted even when quantities of molasses as low as 2 per cent are present.

About the colorimetric determination of injurious nitrogen in the sugar beet, G. FRIEDL (*Osterr. Ungar. Ztschr. Zuckerindus. u. Landw., 40 (1911), No. 1, pp. 274–284, figs. 5*).—A continuation of the work previously noted (E. S. R., 23, p. 514). The colorimetric method is described in which the Stammer colorimeter is used and the color of filtrate obtained in the copper hydroxid precipitation is compared with standard colored glasses. The term "injurious nitrogen" is discussed with regard to whether ammoniacal and amid nitrogen should be included in the term.

Bottling and preserving of fruit, T. REDINGTON (*Agr. Jour. Brit. East Africa, 4 (1912), No. 4, pp. 289–295*).—Directions are given for the home canning of fruits, together with recipes for preparation of "fruit-cheese," jellies, jams, and fruit juices.

The unfermentable sugar (pentose) and furfurol formation in wines, R. HAID (*Ztschr. Gärungsphysiol., 2 (1912), No. 2, pp. 107–109*).—The furfurol in wines originates from a pentose which is not an arabinose. The formation of this aldehyde is gradual and its production increases with the concentration of the wine.

METEOROLOGY—WATER.

Report of the meteorological station at Berkeley, California, for the year ending June 30, 1913, W. G. REED (*Univ. Cal. Pubs. Geogr., 1 (1914), No. 6, pp. 247–306, pls. 3, figs. 8*).—Observations on pressure, temperature, precipitation, cloudiness, and wind at Berkeley during the year ended June 30, 1913, are summarized and discussed in this paper. The mean temperature for the year was 57° F.; the precipitation was 15.63 in., or 10.54 in. less than the average. September and November had more than the average rainfall, but all the other months had less.

Meteorological observations made at Berkeley from July 1, 1887, to June 30, 1912, A. O. LELSCHNER (*Univ. Cal. Pubs. Geogr., 1 (1914), No. 5, pp. 241–246*).—Observations on temperature, pressure, rainfall, humidity, and cloudiness at Berkeley from July 1, 1887, to June 30, 1912, are summarized in this report.

The mean pressure, calculated from these observations, is 30.019, the 25-year range 1.633; the mean temperature 54° F.; maximum temperature, June 6, 1903, 101.1°; minimum temperature, January 14, 1888, 24.9°; the mean rainfall, 26.62 in.; mean relative humidity, 85.5 per cent; minimum humidity, October 28, 1890, 2 p. m., 27.3 per cent; and average number of clear days 156, fair days 88, foggy days 56, and days on which rain fell 71.

Meteorological summaries for the year 1911 (*Kentucky Sta. Rpt. 1911, pp. 347–350*).—Observations at the State University at Lexington on temperature, pressure, precipitation, cloudiness, wind, and miscellaneous phenomena are reported in tables.

The climate of British Columbia, E. B. REED ET AL. (*Bur. Prov. Inform. [Brit. Columbia] Bul. 27, 2. ed. (1914), pp. 12, pl. 1*).—Data, mainly on temperature and precipitation, at different places in British Columbia during 1911 to 1913 are compiled and briefly discussed, the characteristic features of the climate of the Province being indicated.

The weather of Scotland in 1913, A. WATT (*Trans. Highland and Agr. Soc. Scotland, 5. ser., 26 (1914), pp. 288–300*).—"This report consists of (1) a general description of the weather over the Scottish area from month to month; (2) a selection of rainfall returns, in which each county in Scotland is represented by one or more stations. . . . The outstanding feature of the year was perhaps the long-continued spell of dry weather in summer."

Temperature, precipitation, and water-table fluctuations in northern Europe, A. WALLÉN (*Met. Ztschr., 31 (1914), No. 5, pp. 209–220, figs. 8*).—These fluctuations are shown diagrammatically and briefly explained.

Analyses of mineral and potable waters, A. M. PETER, S. D. AVERITT, and O. M. SHEDD (*Kentucky Sta. Rpt. 1911, pp. 329–346*).—Analyses (mostly partial) of miscellaneous samples are reported.

The fertilizing value of sewage and sewage sludge, H. W. CLARK (*Surveyor, 45 (1914), No. 1162, pp. 687, 688*).—A summary of an article previously noted (E. S. R., 30, p. 621).

SOILS—FERTILIZERS.

Economic waste from soil erosion, R. O. E. DAVIS (*U. S. Dept. Agr. Yearbook 1913, pp. 207–220, pls. 6*).—The author in a general survey of the economic aspects of soil erosion points out that the fertility of the fields in many hilly

sections is being reduced by the bodily removal of the soil material. He particularly draws attention to the relative erosion of forested and cleared lands, and to the relation of erosion to lumbering, mining, power development, navigation, and agriculture. It is pointed out that the main factor in the better utilization of rainfall, the reclamation of eroded soils, and the prevention of soil erosion, is the retention of water where it falls by means of different soil treatments, including terracing, deep plowing, foresting, increasing the humus supply, etc., thus either increasing the porosity of the soil and its absorptive capacity for rain water, or decreasing the velocity of the surface run-off and keeping it within safe limits.

Soil erosion and its remedy by terracing and tree planting, J. R. SMITH (*Science, n. ser., 39 (1914), No. 1015, pp. 858–862*).—The author in discussing erosion of sloping soils, and factors aggravating or retarding this, draws attention to the possibilities offered by the so-called plowless utilization of land, not only for checking erosion, but also for increasing the crop area. This plan includes as main factors (1) forestry by means of crop trees to control erosion and provide forage and food, and (2) moisture and fertility control by means of careful terracing.

The influence of winds in the formation of agricultural soils, A. BENCKE (*Naturwissenschaften, 2 (1914), No. 16, pp. 396–398*).—The author discusses briefly wind erosion, transportation, and deposition of soil-forming materials, relative to the formation and fertility of different types of agricultural soils.

The environment of soil organisms, F. H. H. VAN SUCHTELEN (*Science, n. ser., 39 (1914), No. 1012, p. 763*).—In a study of soil as a culture medium a method was devised for obtaining the soil solution based on its displacement by inactive substances (paraffin oil, vaseline, etc.). The concentration of the soil solution thus obtained was similar to that of the very first portion of drainage water obtained by careful percolation through a large quantity of soil. Physico-chemical and chemical examinations of the liquid obtained by the displacement process showed that different soils, soils closely adjacent, and soils of the different layers, contained soil solutions of different compositions.

Antagonism between salts as affecting soil bacteria, C. B. LIPMAN (*Science, n. ser., 39 (1914), No. 1012, p. 764*).—Experiments dealing with the antagonism between anions of the alkali salts—sodium chlorid, sodium carbonate, and sodium sulphate—showed that both as regards ammonification and nitrification it was possible to improve the soil as a medium after it had been made toxic for the bacteria in question by means of any one of these salts, through the addition of any other of the three. "Thus briefly, it was possible at times to triple and quadruple the total salt content of the soil and still make it a better medium for ammonification and nitrification than it was with one-third or one-fourth of the total salt content consisting, however, of but one salt." The author indicates the great significance of this in regard to the management and control of alkali land.

Studies on ammonification in soils by pure cultures, C. B. LIPMAN and P. S. BURGESS (*Univ. Cal. Pubs. Agr. Sci., 1 (1914), No. 7, pp. 141–172*).—Comparative tests of the power of pure cultures of *Bacillus mesentericus vulgatus, Pseudomonas putida, B. vulgatus, B. megatherium, B. mycoides, B. subtilis, B. tumescens, Sarcina lutea, B. proteus vulgaris, B. icteroides, B. ramosus, Streptothrix* sp., *P. fluorescens, P. vulgaris* (Novy strain), and *Micrococcus tetragenus* to produce ammonia from dried blood, tankage, cotton-seed meal, sheep and goat manure, peptone, fish guano, and bat guano in sandy soil, clay loam, and black clay adobe soil are reported and discussed and the results compared with those obtained by other investigators.

It was found that the nature of the soil, as well as the nature of the nitrogenous matter, markedly modified the ammonifying powers of an organism, there being no regularity or certainty in these variations; but every organism did best with a definite combination of soil and organic matter. *B. tumescens* appeared on the whole to be the most efficient organism tested.

In sandy soil as a medium *B. vulgaris* was the most efficient ammonifier with dried blood; *B. mesentericus* with tankage; *B. tumescens* with cotton-seed meal; *B. vulgaris* with fish guano; *B. mycoides* with bat guano; *B. megatherium* with sheep and goat manure; and *S. lutea* with peptone. Using the clay loam soil as a medium *B. proteus vulgaris* was the most efficient with dried blood; *B. tumescens* with tankage; *Streptothrix* sp. with cotton-seed meal; and *B. megatherium* with fish guano. Using the clay adobe soil as a medium *B. tumescens* was the most efficient with dried blood; *S. lutea* with tankage; *B. tumescens* with cotton-seed meal; and *B. vulgaris* with fish guano.

The highest efficiency in a single culture with a fertilizer was shown by *B. mycoides* in bat guano and in a single culture with peptone by *S. lutea*. A comparison of availability of nitrogenous fertilizers with ammonifiability as a criterion showed tankage, fish guano, and cotton-seed meal to be superior in most or in many cases to dried blood. Some of the organisms tested, particularly *B. ieteroides* and *P. fluorescens*, were consistently weak ammonifiers.

Nitrogen accumulation in continuous rye culture, P. Ehrenberg (*Fühling's Landw. Ztg., 63 (1914), No. 5, pp. 178, 179*).—The author defends his views as set forth in a previous article (E. S. R., 30, p. 424).

Nitrogen and organic matter in dry-farm soils, R. Stewart and C. T. Hirst (*Jour. Amer. Soc. Agron., 6 (1914), No. 2, pp. 49–56*).—Studies of the nitrogen and humus content of virgin soils, and soils which have been dry-farmed (by continuous cropping or summer fallowing) for different lengths of time, in the Bear River, Salt Lake, and Juab valleys of Utah, yielded results and conclusions similar to those obtained in previous work in the Cache Valley (E. S. R., 24, p. 422). That no marked decrease was shown in the nitrogen and humus supply of the surface-cultivated, dry-farm soils "is probably due to the deep-rooted character of the wheat plant when grown under dry-farm conditions and to the fact that very little erosion takes place by wind or water."

Sulfofication in soils, P. E. Brown and E. H. Kellogg (*Science, n. ser., 39 (1914), No. 1012, pp. 764, 765*).—In this article it is maintained that soils have a definite "sulfofying power" (power of producing sulphates from other sulphur compounds) which may be determined in the laboratory as follows:

Add 0.1 gm. of a sulphid, or of sulphur, to 100 gm. of fresh, uncontaminated soil, and bring the moisture conditions to the optimum by additions of sterile water. Incubate the soils for from 4 to 5 days at room temperature, after which leach out the sulphates by shaking for 6 hours with water. The sum of the sulphate content of the soil itself and the purely chemical oxidation of the sulphid occurring upon shaking, subtracted from the total sulphate content of the soil after incubation, gives the sulfofying power of the soil, or the physiological efficiency of the sulphur oxidizing bacteria in the soil.

The awakening of the soil, A. Muntz and H. Gaudechon (*Ann. Sci. Agron., 4. ser., 2 (1913), II, No. 1, pp. 1–15, fig. 1*).—This is a full account of investigations briefly noted elsewhere (E. S. R., 26, p. 722).

The fertility of the soil, B. P. Smoot (*Missouri Bd. Agr. Mo. Bul. 12 (1914), No. 3, pp. 31*).—It is the purpose of this bulletin to present in popular form the scientific facts underlying the principles of soil fertility and soil management.

The benefits of deep plowing and of maintaining the humus supply in soils are particularly emphasized and the keeping of live stock is discussed in its

relation to maintaining the soil fertility. General information is given regarding commercial fertilizers, soil correctives and stimulants, and their use.

The duration of the action of manures, A. D. HALL (*Jour. Roy. Agr. Soc. England, 74 (1913), pp. 119–126*).—This article is based upon results of experiments begun at Rothamsted in 1904 with an alternating rotation of wheat and root crops on "eight sets of five plats; five for nitrogenous manures—dung made from roots and hay only, cake-fed dung, shoddy (wool waste), Peruvian guano, rape dust, and three for phosphatic manures—bone meal, superphosphate, and basic slag. Once during each rotation a dressing of superphosphate and sulphate of potash was applied equally to all the nitrogen plats; similarly for the corn [grain] crops a dressing of sulphate of ammonia was given alike to all the phosphatic plats. For each manurial series there was one check plat unmanured."

Of the manured plats "one received the manure in 1904, but remained unmanured in 1905, 1906, and 1907; a second plat was manured in 1906, but not in 1907; the third in 1907. Thus in 1907, by which year the experiment was in full swing, there was a plat that had been manured in that year, another that had been manured in the previous year; a third two years previously; and a fourth three years previously. In 1908 it was considered that the manure applied in 1904 to the first plat had been exhausted by the four crops grown with it, and the manuring was renewed on that plat; on the second plat it was renewed in 1909, and so on; the result being that in any year after 1907 there was a crop grown on some plat with the manure; on a second plat with the residue of the manure after one crop had been taken; on a third with the residue after two crops; and on a fourth with the residue after three crops; while there was a further check plat that had never received the manure."

The conclusions reached are summarized as follows: "As regards farmyard manure we can distinguish between the nitrogenous compounds introduced by the consumption of cakes and other concentrated feeding stuff and the compounds derived from the straw and the undigested residues of such coarse foods as hay. The former will have an immediate effect on the first crop, and to a much smaller extent on the second crop, after which they disappear; the latter compounds act slowly, do not waste, and have a measurable value for many years, though for practical purposes we may neglect their action after the fourth year.

"Among nitrogenous fertilizers ammonium compounds and nitrate of soda have no perceptible action after the first year; Peruvian guano, rape cake, and similar fertilizers containing proteins leave very little residue after the first year, and none after the second. On the other hand, nitrogenous fertilizers of the wool, hair, bone class are slowly acting and nonwasting; their effect may be expected to persist for at least four years.

"Phosphatic fertilizers, even when soluble like superphosphate, do not waste in the soil, and their residues continue to be effective until they have been exhausted by the crops.

"To one other point attention may be called, though it does not arise strictly out of these experiments. It is seen that the residues of active nitrogenous fertilizers are wasted; this wastage takes place in the winter, for soils in the autumn after the crop has been removed become very rich in nitrates, which usually disappear before the spring. Hence, especially in rich soils, there will be a great economy if before the winter the land can be occupied by a rapidly growing catch crop which will convert these fugitive nitrates, etc., into insoluble plant material, afterwards plowed in to become available for another crop."

Interpreting fertilizer tests, C. E. THORNE (*Jour. Amer. Soc. Agron., 5 (1913), No. 3, pp. 129–137*).—A reply to criticisms of the plan of fertilizer

experiments at the Ohio Station contained in an article by Warren, previously noted (E. S. R., 29, p. 213).

Further notes on interpreting fertilizer tests, G. F. WARREN (*Jour. Amer. Soc. Agron., 5 (1913), No. 3, pp. 137–140*).—A reply to the article noted above reiterating certain points emphasized in the previous articles, viz, that in fertilizer experiments "(1) more attention should be given to the place in the rotation at which fertilizers are applied. (2) The difference between the cost of a fertilizer and the value of the increased crop is not all profit. The extra cost of harvesting, storing, and marketing increased crops must also be considered, particularly in cases where a very expensive treatment gives only slightly greater returns above fertilizer cost than is given by a cheaper treatment. (3) Too little attention is given to the inceased value of the land because of the residual effect of fertilizers."

Fertilizing the rotation, H. O. BUCKMAN (*Jour. Amer. Soc. Agron., 5 (1913), No. 3, pp. 157–164*).—Conclusions regarding the time and manner of fertilizing a rotation are drawn from data derived from various sources.

Stimulants of plant growth (*Rev. Sci. [Paris], 52 (1914), I, No. 21, p. 663*).—This is a brief note referring to the use by Payen in 1837 of the term "stimulant" as applied to certain kinds of fertilizing materials now frequently referred to as catalytic.

The fertilizing value of the above-ground parts of cereals and leguminous plants, J. MIKULOWSKI-POMORSKI (*Kosmos [Lemberg], 38 (1913), pp. 929–951*).—From the large amount of data bearing upon this subject which are reported the conclusion is drawn that the greater value of leguminous plants for green manuring as compared with cereals is due not only to the ability of the former to utilize the free nitrogen of the air but also to the fact that the nitrogen which leguminous plants contain is qualitatively of greater fertilizing value than that of cereals. This is true not only of the stems and leaves but also of the seed.

The nitrogen of Gramineæ in the earlier stages of growth is of greater fertilizing value than that of the maturer plants. The fertilizing value decreases as the plants approach maturity. Thoroughly ripe straw may even be injurious. Such marked changes were not observed in the leguminous plants as they matured. The nitrogen of the seed of leguminous plants was of greater fertilizing value than that of the stems and leaves.

The changes of stable manure during storage and its action in soil, F. LÖHNIS and J. H. SMITH (*Fühling's Landw. Ztg., 63 (1914), No. 5, pp. 153–167*).—Experiments with fresh stable manure and manure in different stages of decay to determine (1) the numbers and kinds of organisms present, (2) the qualitative and quantitative changes undergone by the solid and liquid constituents when separated and combined, particularly as regards the nitrogen content, and (3) the extent of the activity in soil of the nitrogen content are reported.

The results indicate the importance of preventing the great losses of nitrogen in manure during storage and in distribution and of better utilizing the plant food content. The following conclusions are drawn: Urine may be mixed with peat dust and used in that form, thus decreasing the loss of nitrogen through ammonia evaporation. Excrement and straw mixture and urine when used separately have a better effect and suffer less loss in value. The chief value of excrement and straw mixture lies in its high bacterial content and its richness in humus-forming organic matter. Its fertilizing value is always small and in the most favorable cases the nitrogen action can increase only about 20 per cent in the first year. About one-half of the excrement nitrogen is present in the form of living and dead microbes, the other part being derived from the

indigestible parts of the animal food. A rapid mineralization is in both cases prevented. Likewise the plant food in the straw is only very gradually broken down and made available. In direct contrast to these urine is relatively poor in bacteria and humus-forming matter but rich in active plant food. A mixture of solid and liquid manure often has a better fertilizing effect the first year than the mixture without urine, but the second year shows great losses due to storage of the manure in the soil and imperfect utilization of the plant food content of the urine. Urine used in separate form gives as good results as ammonium sulphate or sodium nitrate. The nitrogen losses from manure during storage are due in part to volatilization of ammonia and in part to the setting free of elementary nitrogen. The losses due to denitrification are unimportant, as the deficiency in nitrates usually make denitrification either impossible or very limited. A determination of the carbon content in manure is of special importance since the quantity and kind of carbon combinations largely determine the extent of the activity of the plant food added in manure. Nitrate-forming bacteria can be found in every manure, but not in noteworthy numbers.

The utilization of peat in Italy. U. Rossi (*Bol. Quind. Soc. Agr. Ital., 19 (1914), No. 10, pp. 356–361*).—This article discusses particularly the preparation of ammonium sulphate from peat.

The manufacture of nitrates by direct electrolysis of peat. G. Dary (*Elect. Rev., 73 (1913), No. 1882, pp. 1020, 1021, figs. 2; Jour. Amer. Peat Soc., 7 (1914), No. 1, pp. 20–26, figs. 2; Engrais, 29 (1914), No. 12, pp. 329–333*).—A process of electrolytically extracting nitric acid from nitrifying peat is described.

The present state of the cyanamid industry. E. J. Pranke (*Jour. Indus. and Engin. Chem., 6 (1914), No. 5, pp. 415–419*).—It is estimated that the world's production of calcium cyanamid will reach 275,000 tons in 1914. The works at Niagara Falls, Canada, are being increased to a capacity of 64,000 tons. Recent improvements in the manufacture of the product are described and its use as a fertilizer is discussed.

The production of phosphates. Maizières (*Engrais, 28 (1913), Nos. 46, pp. 1274–1276; 47, pp. 1302–1304; 48, pp. 1330, 1331; 50, pp. 1386–1388, fig. 1; 52, pp. 1442, 1443*).—This article deals particularly with the production of phosphates in Algeria and Tunis.

The action of guano components on carbonates in phosphoriferous rock on Nauru Island. C. Elschner (*Amer. Fert., 40 (1914), No. 10, pp. 25–27, fig. 1*).—The probable formation of these phosphate deposits by the infiltration of the dolomitic reefs with solutions of guano deposits is discussed and analyses of the phosphates are given.

Potash salts: Summary for 1913. W. C. Phalen (*U. S. Geol. Survey, Mineral Resources of the United States, 1913, pt. 2, pp. 85–107*).—A brief account is given of progress in investigations by the Geological Survey and the Bureau of Soils with reference to possible commercial sources of potash in the United States.

It is stated that the activities of the Survey in this direction were more restricted in 1913 than in previous years. Field drilling was carried on to a limited extent and in only two areas, the Columbus Marsh and Black Rock Desert, Nevada. The report deals with the development of saline potash deposits in California (Searles Lake), Oklahoma, and Texas; alunite and kelp as sources of potash salts and as fertilizers; the preparation of potash salts from silicate rocks; and statistics of imports and consumption of potash salts and other fertilizing materials in the United States.

A bibliography of recent papers on the subject is given.

The production of feldspar in 1913. F. J. Katz (*U. S. Geol. Survey, Mineral Resources of the United States, 1913, pt. 2, pp. 145–151*).—This bulletin dis-

cusses the composition, occurrence, and uses of feldspar and gives statistics of productinon in the United States and other countries.

"The marketed production of feldspar in the United States in 1913 was 120,955 short tons, valued at $776,551. Both in quantity and in value this was the largest recorded annual production. Each important producing State—California, Connecticut, Maine, Maryland, New York, North Carolina, and Pennsylvania—showed an increase in both quantity and value. During the year about 50 quarries marketed feldspar. Ten of them were new producers. Notwithstanding the increase in quantity and the production from new sources the average price per ton of the total production was higher than in any other year."

Alunite, a newly discovered deposit near Marysvale, Utah, B. S. BUTLER and H. S. GALE (*U. S. Geol. Survey Bul. 511 (1912), pp. 64, pls. 3*).—This deposit is described and its significance as a source of potash is discussed. Other known occurrences of alunite in the United States, as well as in foreign countries, are also referred to.

"The Marysvale deposit, so far as now known, is not of such magnitude as to afford a source of all the potash salts now consumed in the United States, but it may prove to be an important factor in providing an American supply that will perhaps be especially available to local and western markets, particularly in meeting the demand for higher-grade salts. Possibly also the greatest importance of the commercial development of this deposit will be in the added stimulus it may afford to exploration for other similar deposits of this mineral, especially in this general region, and it is on the discovery of such other deposits that the provision of a home supply from this source must depend."

It is estimated that the Marysvale deposit would yield 30,000 tons of potash for each hundred feet in depth or from one-sixth to one-seventh of the total annual consumption of the United States.

Ground limestone for southern soils. C. G. HOPKINS (*South. Settlement and Develop. Organ., Farm Truth 1 (1914), pp. 38*).—The need and value of liming (use of ground limestone) for southern soils is fully set forth largely on the basis of experiment station work, and practical directions for liming are given.

Soil acidity and liming (*Missouri Bd. Agr. Mo. Bul., 12 (1914), No. 2, pp. 27, figs. 11*).—This bulletin is a partial reprint, with an introductory chapter by M. F. Miller, of those parts of Wisconsin Station Bulletin 230 (E. S. R., 29, p. 623), which are considered applicable to Missouri conditions.

It is stated that the soils in Missouri which are the most strikingly in need of lime are the more level portions of the prairies of northeast and southwest Missouri which are inclined to be wet. Other areas needing it are some of the old farmed lands and high ridge tops of the Ozark border and Ozark region proper. The poorer timber lands of northeast Missouri along the streams in the central and eastern parts of the State are in general more or less in need of lime.

The removal of lime from soil by acid furnace fumes and its effect on plants, A. WIELER (*Jahresber. Ver. Angew. Bot., 10 (1912), pp. 58–74, figs. 6*).—From his experiments with trees and field crops on limed and unlimed soils in the vicinity of smelters the author arrived at practically the same conclusions as in previous work (E. S. R., 28, p. 623).

Useful minerals of the United States, S. SANFORD and R. W. STONE (*U. S. Geol. Survey Bul. 585 (1914), pp. 250*).—This is a list showing the composition, character, and location of deposits of the principal useful minerals in each State.

The American fertilizer handbook, 1914 (*Philadelphia, 1914, pp. 456, figs. 50*).—This handbook contains as usual directories of fertilizer manufacturers and allied fertilizer trades, cotton-seed oil mills, and packers and renderers, as well as special articles, statistics, and miscellaneous information relating to the fertilizer industry. Among the more important articles included are The Sulphuric Acid Industry, by A. M. Fairlie; Tables for Making Fertilizer Formulae, by W. D. Rhea; Digest of State Fertilizer Laws; Available Phosphates by Furnace Treatment, by J. H. Payne; Available Nitrogen in Compounds, by E. P. Verner; Present State of the Cyanamid Industry, by E. J. Pranke; The World-Wide Search for Potash, by H. Wilson; Phosphate Rock Production in 1912, 1913, by W. C. Phalen; Florida Phosphate Rock, 1913, by E. H. Sellards; Mining of Florida Pebble Phosphate Rock, by T. M. Peters; The Western Phosphate Deposits, by M. S. Duffield; The Products of Cotton Seed, by T. C. Law; The Use of Packing House By-Products, by J. B. Sardy; Tankage and Dried Blood, by J. W. Turrentine; and The Western Animal Ammoniate Market, by J. B. Sardy.

Commercial fertilizers, W. J. Jones, jr., et al. (*Indiana Sta. Bul. 174 (1914), pp. 477–594, fig. 1*).—This is a detailed report of inspection of fertilizers in Indiana during 1913 including analyses of 1,204 samples.

The results show that the amount of fertilizers sold was greater and the quality better in 1913 than in any previous year. It is estimated that the consumption of fertilizers in the State in that year was 193,899 tons, valued at $4,516,404.

Analyses of fertilizers, fall season, 1913, B. W. Kilgore et al. (*Bul. N. C. Dept. Agr., 35 (1914), No. 3, pp. 93*).—This bulletin contains analyses and valuations of fertilizers collected by the fertilizer inspectors of the state department of agriculture during the fall of 1913, as well as a list of brands of fertilizers registered for sale during the fall season.

AGRICULTURAL BOTANY.

Lectures in plant physiology, L. Jost (*Vorlesungen über Pflanzenphysiologie. Jena, 1913, 3. ed., pp. XVI+760, pls. 2, figs. 193*).—This is a third edition of the author's lectures on plant physiology (E. S. R., 19, p. 529) in which the subject matter is brought up to date and the references to literature given to January, 1913, with occasional later citations.

The general plan of the work is not changed except in the matter of citing literature. By means of a system of abbreviations and placing the citations at the bottom of the page, considerable space has been gained.

Catalytic effects of light in germinating seeds, E. Lehmann (*Biochem. Ztschr., 50 (1913), No. 5–6, pp. 388–392*).—It is stated that the germination of seeds of *Epilobium hirsutum*, moistened with distilled water and kept in darkness at from 22 to 24° C., was in each case increased or hastened by the addition of papayotin, trypsin, or muriatic acid in a way analogous to the influence of light, which is held to act catalytically upon albumen in the seeds.

Self-warming by plants in Dewar flasks, H. Molisch (*Ztschr. Bot., 6 (1914), No. 4, pp. 305–335, figs. 3*).—Tests made by the employment of Dewar flasks on the development of heat by flowers, leaves, or fruits of several dicotyledonous plants, also with mosses, lichens, fungi, and algæ, are given in tabular detail.

Most leaves and flowers develop considerable heat, some however much less. Mosses, algæ, and a number of common fruits develop little heat as a rule. Lichens show considerable differences in this respect, as do some fungi.

Transpiration by Viscum album in comparison with that by other plants, deciduous or evergreen, Z. KAMERLING (*Ber. Deut. Bot. Gesell., 32 (1914), No. 1, pp. 10–16, figs. 2*).—Separated shoots of mistletoe, apple, poplar, conifers, etc., exposed to evaporation showed some striking differences in water loss per unit area of foliage during the early stages of experiment. The relatively larger transpiring surface soon led to wilting and death of the deciduous shoots employed, while the evergreen, presumably through better stomatal control, resisted desiccation for a longer time. The desiccation curves of *V. album* lay between those of the two classes above mentioned, though showing some irregularities which are ascribed to a possible antagonism between the guard and neighboring cells of the stomatal apparatus.

Transpiration experiments with tropical Loranthaceæ, Z. KAMERLING (*Ber. Deut. Bot. Gesell., 32 (1914), No. 1, pp. 17–24, fig. 1*).—It appears from experiments with *Loranthus pentandrus* on *Mangifera indica* in Java that the daily loss per unit area of leaf surface of the parasite was about 50 per cent greater than that of the host, this difference being accentuated during the hotter part of the day, owing, presumably, to the observed better control of the stomata by the host. The same general relation was apparent in case of *L. dichrous* and its host *Psidium guajava*. This high evaporation rate is considered as significant in connection with the injury to the host plant noted in case of these growths, sometimes resulting in desiccation and death of the part beyond the location of the semiparasite.

Nitrogen transformations in some Actinomycetes, II, F. MÜNTER (*Centbl. Bakt. [etc.], 2. Abt., 39 (1914), No. 23–25, pp. 561–583, figs. 3*).—Reporting the completion of work previously given in part (E. S. R., 29, p. 222), the author states that in the present series of studies employing the same organisms as formerly (*Actinomyces odorifer, A. chromogenes, A. albus*, and three species of Actinomyces from German East Africa), it was found that all these are capable of separating ammonia from organic sources. No formation of ammonia compounds from nitrates was noted. The nitrogen which disappeared from nitrates in solution was almost wholly recovered from the organisms. Alkaline media developed a slender mycelium, neutral media a heavier, ranker tissue, and those of acid reaction gave mycelium of a peculiar swollen appearance. These organisms, grown in solutions with Azotobacter, checked the activity of the latter and this was true of them in higher degree in connection with other fungi, yeasts, and Actinomycetes tested.

Reduction of nitrates to nitrites and ammonia by bacteria, M. KLAESER (*Ber. Deut. Bot. Gesell., 32 (1914), No. 1, pp. 58–61*).—Reporting on studies employing 28 species of bacteria in nutritive solutions of varying composition, the author holds that nitrates and nitrites are probably not formed by these bacteria from ammonia or from peptone, but that a number of them do form ammonia from peptone.

Studies on anthocyanin.—I, Color in the cornflower, R. WILLSTÄTTER and A. E. EVEREST (*Liebigs Ann. Chem., 401 (1913), No. 2, pp. 189–232, figs. 4; abs. in Gard. Chron., 3. ser., 55 (1914), No. 1419, p. 168*).—To a brief discussion of previous work by others on flower coloration, the authors add the results to date of their own experimental studies on problems related to the chemical composition and history of anthocyanin pigments in plants, in particular *Centaurea cyanus*.

It is claimed that the successful isolation and study of anthocyanin shows a close and definite relation between the blue, the violet, and the red pigment, all these representing the anthocyanin glucosid, but depending respectively upon whether this assumes the form of a free acid, such an acid combined with potassium, or occurs in connection with a plant acid. Since each of these forms

may, by isomerism, become colorless, it is suggested that such a change may be instrumental in producing the white flowers, but this has not yet been established.

The localization of potash compounds in the sugar beet and their physiological relation, A. MATOUŠEK (*Ztschr. Zuckerindus. Böhmen, 38 (1914), No. 5, pp. 235–251, figs. 6*).—The author reports that potash salts are to be found in the embryo of the sugar beet seed. In the plant potash is widely distributed, being most abundant in the leaf blade, less so in the petiole, and least in the roots. In the blade of the leaf potash is more abundant in the portions beneath the upper epidermis. The xylem part of the fibrovascular bundles in leaves, roots, etc., has a higher content of potash than the phloëm. In the root the potash content is highest in the upper part, particularly in the corky portions, and tends to increase in the vicinity of any wounds. In water cultures, in the absence of potash in the nutrient medium, potash is found in the blade of the leaf, the roots containing practically none. Etiolated leaves have a very low content of potash, and the general distribution of potassium compounds in etiolated plants, as well as those grown with a limited amount of potash, is similar to that in normal plants.

Comparative studies on tropisms.—VI, Influence of alkalies and alkaline earths on Lupinus albus, T. M. PORODKO (*Ber. Deut. Bot. Gesell., 32 (1914), No. 1, pp. 25–35, fig. 1*).—Previous work, mainly qualitative (E. S. R., 25, p. 632) regarding the effects of solutions on tropisms, has been followed by studies on the responses, quantitatively considered, of white lupine seedlings tested with solutions of alkalies and alkaline earths in different strengths. The results are given in tabular detail.

The action of certain compounds of zinc, arsenic, and boron on the growth of plants, WINIFRED E. BRENCHLEY (*Ann. Bot. [London], 28 (1914), No. 110, pp. 283–301, figs. 17*).—Results are given of water culture experiments of peas and barley in which the action of zinc sulphate, arsenic compounds, and boric acid was tested.

Zinc sulphate in high concentrations was found very toxic to barley and peas and no evidence of stimulation was obtained even when as great a dilution as 1 to 200,000,000 parts was used. Arsenious acid was found more toxic in its action on peas and barley than arsenic acid. This distinction also held good for sodium arsenite and sodium arsenate. No stimulation was observed even with the smallest quantities tested. Boric acid was found less poisonous than zinc sulphate or arsenic compounds, especially with peas. Barley showed some evidence of stimulation with the weaker strengths of boric acid, but this was not borne out by an examination of the dry weights. Peas, on the other hand, were definitely stimulated with relatively high concentrations of boric acid. Where the higher strengths of this poison were used the action was quite evident, the leaves tending to become brown and to die in a characteristic manner.

Recent studies on diffusion and localization of ions in plant tissues, C. ACQUA (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 22 (1913), II, No. 11, pp. 594–598*).—In extension of work previously noted (E. S. R., 30, p. 31), the author tested the effects upon development of seedlings exerted by cerium.

It was found that development, especially of the root system, of *Triticum sativum* is quickly checked by cerium chlorid in very dilute solution, no secondary roots being formed in the cases observed. Microscopic examination showed a yellow deposit in the cortical cylinder of the roots, which increased and finally occupied in part the intercellular spaces. These results, agreeing with those previously noted when employing manganese, uranium, and lead,

were also confirmed in essential details in further experiments with *Zea mays* and *Phaseolus vulgaris*.

Experimental production of hyperplasia in plants, L. PETRI (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 22 (1913), II, No. 10, pp. 509–516, figs. 3*).—A preliminary report is made showing some results obtained by injecting solutions of peptone, urea, etc., of not over 1 per cent strength into growing cortical tissue of stems and roots.

Comparison of microphotographic views shows that the thickening of the tissue is due mainly to a great enlargement of the cells individually. The cell walls remain thin and tender. These indications of arrested development are compared with effects observed to follow exposure to cold or puncture by insects.

Some experiments on the effect of external stimuli on the sporidia of Puccinia malvacearum, W. ROBINSON (*Ann. Bot. [London], 28 (1914), No. 110, pp. 331–340, figs. 7*).—Cultures were made of spores of *P. malvaccarum* in hanging drop cells, in which the effect of various stimuli were tested.

The sporidia were found to be negatively heliotropic. Moisture and contact were also found to affect the germ tubes. In the normal host plant a slender growth from the swollen end of the germ tube penetrated the cuticle and outer wall of the epidermis, bringing about a true infection, but this was not seen to occur in other plants than the normal hosts. In the case of certain leaves, as Pelargonium, Eucalyptus, and Primula, with glandular secretions, a definite toxic effect was exerted on the sporidia and germ tubes in the immediate neighborhood of the fragment of the leaf. The investigations did not disclose why the normal hosts should be infected while other plants were not. They did show, however, that the germ tube is irritable to light, to moisture to a certain degree, and to contact.

Morphological instability, especially in Pinus radiata, F. E. LLOYD (*Bot. Gaz., 57 (1914), No. 4, pp. 314–319, pl. 1, figs. 2*).—A description is given of a proliferation of spur shoots occurring in the Monterey pine, which has also been seen in other species of Coniferæ. The tree described was growing near a cesspool and it is believed that the water relation of the plant was responsible for the proliferation. A somewhat similar occurrence is reported as having been observed in *P. tæda* after injury.

The effect of climatic conditions on the rate of growth of date palms, A. E. VINSON (*Bot. Gaz., 57 (1914), No. 4, pp. 324–327, pl. 1*).—The results are given of observations of the effect of climate on the rate of growth of date palms made at the cooperative date orchard, Tempe, Ariz.

In these studies comparisons were made between the rate of growth and the temperature. From the platted curves the rate of growth was found to be most active, not at the period of highest maximum, but rather at the highest minimum temperatures, which were warm nights in July, August, and sometimes in September. By far the greater part of the total yearly growth was found to occur in the last half of the year.

The rate of maturing fruit was also investigated. It is thought to be probably influenced by the same factors as the rate of growth of foliage.

The effect of shading on the transpiration and assimilation of the tobacco plant in Cuba, H. HASSELBRING (*Bot. Gaz., 57 (1914), No. 4, pp. 257–286, fig. 1*).—A report is given of experiments conducted in western Cuba to determine the effect on transpiration and assimilation in the tobacco plant of the cheese-cloth shade, which is frequently used in that region for shading tobacco.

It was found under the climatic conditions of the region that the transpiration of the tobacco plants grown in the open was nearly 30 per cent greater than that of plants grown under cheese-cloth shade. The transpiration per

unit of leaf surface was nearly twice as great in the sun plants as in the shade plants. Shading of tobacco plants by this coarse grade of cheese cloth did not seem to result in a diminished production of total plant substance as compared with other plants not shaded. As the leaves of the shade-grown plants had a much greater total area than those of plants grown in the open, it was evident that the quantity of plant material elaborated per unit of leaf area was greater in the plants grown in the open. Although the cheese-cloth shade was found not to influence in any marked degree the total production of dry matter in the plants, the distribution of this substance was so affected that in the shade-grown plants relatively less material was deposited in the leaves and more in the stems than in the corresponding organs of the plants grown in full light. No evidence was secured to indicate that shade influenced the deposition of material in the roots.

A monograph of the fungus group Penicillium, with special reference to the species occurring in Norway. I. O. J. O. Sopp (*Vidensk. Selsk. Skr. [Christiania], Math. Naturv. Kl., No. 11 (1912), pp. VI+208, pls. 23, fig. 1*).—The author gives an account of the morphology and physiology of the various species of Penicillium and related genera known to occur in Norway, discussing their systematic relationships, after which he describes in detail the species of Penicillium, Dactylomyces, Acaulium, Stysanus, Gliocladium, Corollium n. g., and Aspergillopsis.

On the lower fungi.—V, Anisomyxa plantiginis n. g. and sp., B. Němec (*Bul. Internat. Acad. Sci. François Joseph I, 1913, pp. 15, pls. 2, figs. 5; abs. in Riv. Patol. Veg., 6 (1913), No. 7, p. 218*).—A study is reported of an organism found on roots of *Plantago lanceolata*. It is thought to be new and is named *A. plantaginis*.

Studies on heads of wheat and spelt as a contribution to exact classification. M. Kondo (*Landw. Jahrb., 45 (1913), No. 5, pp. 713–817, figs. 3*).—This is a detailed account of studies on 62 varieties of winter and 20 of summer wheat, also 16 of spelt, in regard to characters available for use in exact classification of cultivated grains. Some correlations appearing therefrom are also noted.

Inventory of seeds and plants imported by the Office of Foreign Seed and Plant Introduction during the period from July 1 to September 30, 1912 (*U. S. Dept. Agr., Bur. Plant Indus. Inventory No. 32 (1914), pp. 44, pls. 5*).—This inventory gives notes on the seeds and plants introduced during the period indicated, about 250 numbers being included. These represent collections secured through collaborators, diplomatic and consular officials, or interested amateurs who have forwarded from different parts of the world plants that they thought might prove valuable in this country. Botanical notes and publication of new names are given of a number of species.

FIELD CROPS.

Agricultural researches and the interpretation of their results. A. Grégoire (*Ann. Gembloux, 22 (1912), Nos. 2, pp. 58–173; 3, pp. 130–164; 4, pp. 181–208; Ann. Sta. Agron. Etat Gembloux, 2 (1913), pp. 1–86, figs. 12*).—This discusses field methods and the interpretation of results by the application of mathematical laws bearing upon probable, systematic, and experimental errors, statistical methods, and the law of minimum.

Field experiments and the interpretations of their results. A. Grégoire (*X. Cong. Internat. Agr. Gand, 1913, Raps., Sect. 2, Question 1, pp. 13*).—Essentially the same as the article noted above.

Some factors which influence the water requirements of plants. P. Khankhoje (*Jour. Amer. Soc. Agron., 6 (1914), No. 1, pp. 1–23, fig. 1*).—In this

article the author describes methods employed by him that involve water and sand cultures in which the pots were sealed with paraffin.

It was observed that the kind of crop, the strength of the soil solution, the age of the plant, and the amount of moisture in the soil were factors influencing the water requirements of crops. In wheat plants grown in nutrient solutions ranging from 0.01 to 0.33 per cent in strength from 621 to 210 gm., respectively, of water was required for each gram of dry matter produced.

In regard to methods, basing the results upon dry matter of stalks only or upon that of stalks and roots together, it is noted that in all cases where only stalks have been used the water requirements have been greater and that differences between the two methods diminished as the strength of the solution increased. With a 0.01 per cent solution 1,018 gm. of water were required to produce 1 gm. of dry matter of stalks alone, and 621 gm. to produce 1 gm. of dry matter of plant, including roots, while with 0.33 per cent solution the amounts were 246 and 210 gm., respectively. This and other data from the experiment show that there was less growth of the roots in proportion to the growth of the stalk in the stronger solutions. "The percentages of ash in the plants grown in the different strengths of solution do not agree with each other, nor do they vary in any regular manner."

In pure quartz sand cultures 422, 362, and 261 gm. of water were used to produce 1 gm. of dry matter in wheat plants 50, 90, and 137 days of age, respectively, in solutions of uniform strength.

The water requirements of a crop were shown to increase with the increase of the soil moisture. Data "show that when there is more moisture in the soil there is a larger growth of the plant. But the growth of the plants does not give an idea of the percentage of dry matter."

Irrigated field crops in western Nebraska, F. KNORR (*Nebraska Sta. Bul. 141 (1914), pp. 5–32, figs. 5*).—This bulletin contains suggestions based on work at the Scottsbluff Substation and designed to be of value to the farmers of western Nebraska in the production of irrigated field corps. These suggestions touch upon the general practice of irrigation; the construction and use of farm irrigation systems; the handling of virgin soils; possible rotations; and methods employed with alfalfa, sugar beets, wheat, oats, barley, potatoes, and corn.

Potash fertilizer experiments, F. HEINE and K. LINDENBERG (*Illus. Landw. Ztg., 34 (1914), No. 12, pp. 110, 111*).—Applications of potash to both heavy loam and clay soils in the vicinity of Halberstadt and Magdeburg in connection with the production of wheat, potatoes, sugar beets, rye, and peas, gave unprofitable yields, indicating an abundant supply of potash already in these soils.

Row fertilizing experiments, AHR (*Mitt. Deut. Landw. Gesell., 29 (1914), Nos. 7, pp. 94–98; 8, pp. 123–125*).—From 2 years of experimental work the author concludes that for a heavy clay soil row fertilization with cereals gave no beneficial results over the ordinary method of broadcasting, but that with stock beets, and probably for all crops planted in wide-distance rows, row fertilization was much superior to other methods. If, however, it implies the use of new, costly, and complicated machinery the row method is not recommended for practice.

Study of relation between space and plant growth, K. GRUNDMANN (*Kühn Arch., 3 (1913), pt. 1, pp. 199–242, fig. 1*).—These experiments were conducted with several varieties of spring wheat, spring barley, and oats, so spaced as to allow 36, 45, 54, 60, 75, 90, 100, and 200 sq. cm. of surface per plant for the several tests. From the resulting data the author made the following conclusions:

Within areas of from 36 (about 5.5 sq. in.) to 100 sq. cm. per plant, the yield of grain per surface unit is the same when soil, fertilizer, cultivation, and climatic conditions remain the same. The development of individual characters is favored by the wide spacing over the narrow, and the number of well-developed elites increases as the size of area per plant increases; a large area per plant insures against lodging and against such other growth suppression as would interfere with experimental results. For select breeding of elites the distance 5 by 20 cm. seemed to be especially good, as the largest number of well-developed plants were secured, a sufficient quantity of kernels was obtained for increase tests, and this distance between plants facilitates plant selection at harvest as well as cultivation. For test plats 3 by 20 cm. seemed to be the best spacing, for with fall-sown rye and wheat it allows for some winterkilling, with winter and spring barley it prevents an unnatural stooling which would tend to increase the protein content, with oats it is a safeguard against damage of frit fly, with all the cereals it allows of cultivation without injury to the plants, and it approaches field conditions and gives a better basis for calculating yields.

Some observations on the transmissible variations of chlorophyll characteristics in cereals, H. NILSSON-EHLE (*Ztschr. Induktive Abstam. u. Vererbungslehre, 9 (1913), No. 4, pp. 289–300, pl. 1*).—It is noted that by selection it was possible to segregate the white (albino) plants of oats, barley, and rye, but not those of wheat, and that breeding showed the white characteristic to be recessive to green.

While the first generation from a single albino plant was all green plants, pure lines from many white plants showed a certain regularity in the appearance of albino plants, half of which would be heterozygous, one-fourth normal green, and one-fourth not viable (a characteristic of albinism as noted by the author). The repeated disappearance of chlorophyll factors is deemed as inexplicable as in the case of the author's experiments with the black factor in the hulls of oats (E. S. R., 29, p. 739).

Illustration of the effect of previous vegetation on a following crop: Cabbage after sesame, J. J. SKINNER (*Plant World, 16 (1913), No. 12, pp. 342–346, fig. 1*).—This article gives the results of an investigation of soil from Middle River, Cal., which show an oily material, apparently left in the soil by the sesame crop, as the cause of an injurious effect on cabbage plants, but not on wheat plants grown in solutions containing extracts from the soil under investigation.

Basing alfalfa yields on green weights, F. D. FARRELL (*Jour. Amer. Soc. Agron., 6 (1914), No. 1, pp. 42–45*).—This paper presents a plea for basing the yields of alfalfa on green weights rather than on weights of "cured hay," and gives data obtained by investigations conducted at Huntley, Mont., and Fallon, Nev., to determine the constancy of weights of green matter of different crops to be used as a basis for comparisons.

The results showed that of the "28 samples taken on 12 different dates at Huntley the average loss in weight was 76.5 per cent of the green weight. Of the 30 samples taken on 10 different dates at Fallon, the average loss in weight was exactly the same as at Huntley. The highest loss was 81.6 per cent at Fallon and 80.6 per cent at Huntley; the lowest at Fallon was 71.7 per cent and at Huntley 70 per cent; the extreme range was 10.6 per cent at Huntley and 5.9 per cent at Fallon.

"The results fail to show any consistent significant differences in the loss in weight of samples cut on different dates or at different stages of growth; that is, when the range of variation in samples cut on the same date or at the same stage of growth is considered it is seen that the variation in samples cut on

different dates and at different stages of growth is not large enough to be considered significant."

Studies on the anatomy of alfalfa, O. T. WILSON (*Kans. Univ. Sci. Bul., 7 (1913), No. 17, pp. 291–299, pls. 5*).—Cross sections of roots, stems, and leaves, and the cellular structure of many parts of the alfalfa plant are described and illustrated.

Growing alfalfa in Iowa, H. D. HUGHES (*Iowa Sta. Circ. 3 (1912), pp. 2–11, figs. 5*).—Cultural notes on alfalfa growing for Iowa conditions.

On the influence of potash and phosphoric acid on the quality of brew barley, L. SCHÜL (*Landw. Jahrb., 45 (1913), No. 5, pp. 641–712*).—Results from field experiments in which potash and phosphoric acid were used singly and combined with nitrogenous fertilizer showed that potash and nitrogen were better appropriated by barley in the presence of phosphoric acid. Potash-phosphatic fertilizers accompanied increased total yields and improved quality. The use of 40 per cent potash salt and of superphosphate as a top-dressing worked favorably. The protein content decreased under the influence of potash and phosphoric acid applications and yield increase. Dry matter increased with considerable regularity with the application of potash and phosphoric acid, regardless of the yield. In general an improvement in 1,000-kernel weight, in size, in percentage of hull, in germination ability, and in germination force was noted as attributive to potash and phosphoric acid. The potash and phosphoric acid-fertilized barley kernels were of a canary yellow.

Investigations on spacing for breeding plants of brew barley, E. CLAUS (*Kühn Arch., 3 (1913), pt. 1, pp. 169–197, figs. 8*).—From data collected in 1911 from several experiments the author concludes that spacing is correlated with stooling, with individual plant weights, and with grain weight per plant. The optimum distance for brew barley in the climate and soil of Halle Station is 5 by 20 cm. (about 2 by 8 in.). The percentage of grain is independent of distance. With brew barley dry matter and extract content are in inverse ratio to distance, while protein content is in direct ratio to distance. In single plants the protein content increased with the stooling, with weight of head, and with kernel weight, and declined when the percentage of grain and stand increased. No correlation between protein content and kernel weight could be detected.

Observations on Beta maritima from 1910–1912, O. MUNERATI, G. MEZZADROLI, and T. V. ZAPPAROLI (*Staz. Sper. Agr. Ital., 46 (1913), No. 6, pp. 415–445, figs. 7; abs. in Österr. Ungar. Ztschr. Zuckerindus. u. Landw., 42 (1913), No. 6, pp. 1015–1023, figs. 4*).—The authors give results of planting seeds of wild beets collected on the Adriatic coast and on the banks of the river Po in 1910.

It is concluded that although most of the individuals produce seed the first year, many do not until the second year, and that these may continue to produce seed annually up to 6 or 7 years. Whether in a wild state or under cultivation they show a great tendency toward wide variations. Some characteristics were rigidly transmitted while others were not. It is noted that the biennial character of some individuals was transmitted regularly 100 per cent, while others of this character produced only annuals.

The results of 2-year selections from the wild form gave beets that weighed 3 kg. and contained 15 per cent of sugar, with a juice of 81 per cent purity and little fiber. Five years of cultivation, it is noted, brought the wild toward the sugar-beet form but not toward the stock-beet form.

On breeding and inheritance questions in red clover, P. HOLDEFLEISS (*Kühn Arch., 3 (1913), pt. 1, pp. 81–115, figs. 3*).—From a 2-year study of color characteristics in red clover the author concluded that in general there was a correlation between yellow seeds and light colored or white flowers, the pure-bred white flowering plants always bearing yellow seeds. Dark red flower color and

violet seed color are correlated with large wide leaves, and yellow seed color and light flower color with long narrow leaves. Foreign pollinization occurs but not to the extent of overthrowing inheritance in pure lines. Fertilization by bumble bees could be detected abundantly among flowers of the same plant and between flowers in the same plat, but seldom between flowers of different plats. A retarded development occurred in plants that were white flowered, in some cases as much as four weeks later than the red flowered plants. The violet colored seeds averaged heavier than the yellow.

Maize, its history, cultivation, handling, and uses. J. BURTT-DAVY (*London, New York, Bombay, and Calcutta, 1914, pp. XL+831, pl. 1, figs. 245*).—A very complete treatise with special reference to corn production in South Africa, and including chapters on importance and history, climatic requirements, geographical distribution, botanical characters, inheritance of characters and improvement by breeding, judging and selection for exhibition, varieties and breeds, soils and manures, tillage, planting, and cultivation, diseases and pests, harvesting and storage, commerce, milling, mill products, chemical composition, the maize grain as food, the preservation and use of maize stover, hay, and silage for stock feed, construction of modern silos, and uses of maize products in the arts and manufactures. A bibliography of 439 titles is attached.

The corn plant and seed selection. H. K. HAYES (*Connecticut State Sta. Rpt. 1913, pt. 6, pp. 353–384, pls. 4*).—In this paper the author gives the results of a series of tests during 1912 and 1913 of the commercial value of first generation crosses and a comparison of yields of shelled corn of several of the more important Connecticut varieties when grown in the same season under uniform conditions.

Twenty-two varieties of yellow and white dent and yellow and white flint that were used in the tests are described. Ear-to-row tests were made. Characters which showed dominance are noted as red cob over white cob color, colored pericarp over colorless pericarp, straight rows over irregular rows, light tillering over heavy tillering, and low protein content over high protein. As a variable character endosperm color is mentioned, and as intermediate characters the number of rows, shelling yield, date of maturity, and height of plant.

Eight crosses are noted as being advantageous crosses, producing yields ranging from 9.2 per cent to 17 per cent higher than the better parent. Griswold Early Dent X Brewer Flint gave the greatest increase, while the cross between Hall Tyler Dent and Brewer Flint produced the highest absolute yield of 73 bu. of crib-dried shelled corn. Tables give the yield of crib-cured corn, comparative yields of first generation hybrids and their parents, tests of sweet-corn varieties and crosses, inheritance of protein, inheritance of row number, percentage of shrinkage, and shelling capacity.

Good seed corn for 1913. H. D. HUGHES (*Iowa Sta. Circ. 4 (1912), pp. 3–11, figs. 7*).—This gives directions for selecting, gathering, and storing seed corn, with special reference to Iowa conditions.

Fertilizer experiment with maize (*Bol. Soc. Agr. Mexicana, 38 (1914), No. 14, pp. 263–265*).—The data show an increased yield over the check plat of 1,794 kg. of grain per hectare (1,596 lbs. per acre) by the use of 50 kg. of superphosphate, 150 kg. of potassium sulphate, and 200 kg. of ammonium sulphate.

Moisture in maize. G. N. BLACKSHAW (*Rhodesia Agr. Jour., 11 (1914), No. 3, pp. 396–398*).—The moisture content is given of 12 samples (sacks) of corn in storage, together with the atmospheric moisture, as determined in 13 periods from October, 1912, to July, 1913.

Tabulated results showed "the maximum variation in moisture recorded during the period of the investigation (mean of 12 samples) was 3.72 per cent, the lowest average being shown in the month of October, 1912, and the highest

in April, 1913. In single bags, the maximum variation in moisture for the same period was 4.6 per cent, and the minimum 3.3 per cent."

An interesting new member of the Gramineæ from Tonkin, CREVOST and C. LEMARIÉ (*Bul. Econ. Indochine, n. ser., 16 (1913), No. 105, pp. 1099, 1100*).—This notes the spontaneous appearance of and describes *Erianthus cây-cong* (Andropogonæ). Its use in Tonkin seems to be in the manufacture of blinds and screens.

Industrial fiber plants of the Philippines, T. MULLER ([*Philippine*] *Bur. Ed. Bul. 49 (1913), pp. 157, pls. 43*).—This bulletin contains a description of the chief industrial fiber plants of the Philippines, and their distribution, method of preparation, and uses, considering ferns, pandans, grasses, bamboos, sedges and similar plants, palms, rattans, vines, plants with leaf or petiole fiber of commercial value, miscellaneous industrial fibers, and Philippine bast fibers, including about 100 specimens.

Nutrient requirements of flax and the influence on the quantity and quality of its fiber, C. CSÓKÁS (*Kisérlet. Közlem., 17 (1914), No. 1, pp. 64–120, pls. 8*).—The results of these experiments are noted as showing that flax requires especially large quantities of potash and nitrogen during the early stages of growth. Quick-working nitrogen fertilizers during the entire growth period showed good results. Phosphatic fertilizers were especially useful in seed production rather than in fiber production. Nitrogen and phosphorus collected chiefly in the leaves, while the potash was found more abundant in the stems, in which part of the plant it played a prominent part in the formation of carbohydrates. The percentage of fiber in the stems was less on those plats when potash was lacking; but the fertilizer had no influence upon the strength of the fiber produced.

Hemp, L. H. DEWEY (*U. S. Dept. Agr. Yearbook 1913, pp. 283–346, pls. 7, figs. 5*).—This article gives the history, names, botanical description, relationship, geographical distribution, and introduction into the United States, varieties, methods of improvement by seed selection, and notes on the cultivation of hemp, including climate, soil, rotation of crops, fertilizers, diseases, insect pests, weeds, harvesting, seed production, and methods of retting and marketing the fiber, with some commercial aspects.

On the appearance of sterile "dwarfs" in Humulus lupulus, E. S. SALMON (*Jour. Genetics, 3 (1914), No. 3, pp. 195–200, pls. 3*).—Seedling hop plants (derived from crossing), the distinguishing features of which are noted as total or almost total inability to climb and complete sterility, are described.

The Ruakura oat, P. MCCONNELL (*Jour. Agr. [New Zeal.], 6 (1913), No. 2, pp. 133–136, figs. 3*).—This article describes a rust-resistant variety of oats derived from a selected spike of Argentina oats in 1908. "It has never been claimed that the new oat is absolutely rust-proof. What can be claimed is that it is the most resistant to disease of all the varieties tested at Ruakura."

A noticeable color factor as an inhibiting factor in awn development in oats, H. NILSSON-EHLE (*Ztschr. Induktive Abstam. u. Vererbungslehre, 12 (1914), No. 1, pp. 36–55*).—In breeding oats the author found that yellow color accompanied awnlessness and that white or black colors and awns were correlated.

By the use of charts the segregation of the color factors in hybrids to F_3 has been graphically shown, together with their relations to the awn factors. The individual plants having the homozygous yellow factor showed a strong suppression in awn development. The yellow color factor not only developed the yellow color, but at the same time had an inhibiting influence on awn development. In the individuals heterozygous for yellow color the inhibiting influence on the awn developments is not so pronounced but still perceptible.

even though the yellow color may be obscured by black, and in such cases it is noted the yellow factor becomes an awn factor.

As an alternative explanation of the appearance of yellow color and awnlessness in oats the author suggests the possible presence of two distinct but accompanying factors.

On the continuous violet colored seed of Pisum arvense, B. KAJANUS (*Fühling's Landw. Ztg., 62 (1913), Nos. 5, pp. 153–160; 24, pp. 849–952*).—Experiments in crossing field peas having more or less of a violet color in the seeds or pods did not result in any regular increase in the amount of colored surface or in establishing any uniformity in this color factor.

Report on the influence of different quantities of potash fertilizer on the yield and starch and protein content of potatoes, C. VON ECKENBRECHER and F. F. HOFFMAN (*Ztschr. Spiritusindus., 1914, Ergänzungsh., pp. 60–66*).—Areas were fertilized with single (300 kg. per hectare or 267 lbs. per acre) and double (600 kg.) applications of potash salt. Results with several varieties at 7 centers showed both plus and minus yields over untreated areas, but a general average increase with the use of potash. There was a decrease in starch content that was greater with the larger applications, while the protein content increased in some varieties and decreased in others.

The selection and treatment of potato seed, J. T. RAMSAY (*Jour. Dept. Agr. Victoria, 12 (1914), No. 2, pp. 73–75, fig. 1*).—A method of selection which secures the use of immature tubers for seed tubers is described. The results of this system are noted as showing an increase of from 30 cwt. to 5 tons of tubers per acre. Sprouting the tubers before planting gave increased yields and other advantages, including the opportunity to reject weaklings.

Report of the German Potato Culture Station in 1913, C. VON ECKENBRECHER (*Ztschr. Spiritusindus., 1914, Ergänzungsh., pp. 3–59*).—Results are reported of testing 21 varieties of potatoes in 32 different fields. Starch contents ranged from 16 to 19.8 per cent, yield per hectare from 17,940 to 34,510 kg., and yield of starch from 3,270 to 6,550 kg. per hectare.

Notes on the culture of sisal in English and German East Africa, P. JANSSENS (*Bul. Agr. Congo Belge, 4 (1913), No. 4, pp. 905–918, figs. 12*).—This describes cultural and manufacturing methods. The weights of 100 leaves in the various Provinces of English East Africa are noted to be from 82 to 127 kg. (180 to 279 lbs.), and the weights of fiber per 100 leaves from 2.3 to 3.6 kg.

The grain sorghums: Immigrant crops that have made good, C. R. BALL (*U. S. Dept. Agr. Yearbook 1913, pp. 221–238, pls. 7, figs. 8*).—In this article the author describes the introduction of grain sorghums into the United States, their usefulness as drought resisters, brings out their economic and commercial values for the arid and semiarid sections of the country, which include statistics on value and acreage, and gives characteristics of the durras, Kafir corn, and milo maize.

Soy beans.—An important Wisconsin crop, R. A. MOORE and E. J. DELWICHE (*Wisconsin Sta. Bul. 236 (1914), pp. 3–20, figs. 6*).—This bulletin contains cultural notes on the soy bean crop as grown in Wisconsin and discusses uses to which the crop may be put.

Data show yields of several varieties covering a period from 1902–1913, inclusive. Pedigreed Early Black soy beans gave an average yield for the 3 years, 1911–1913, ranging from 11 to 18.2 bu. per acre.

Cultural experiments with sugar beets, A. DEMOLON (*Bul. Assoc. Chim. Sucr. et Distill., 31 (1914), No. 8, pp. 576–582*).—Part of this paper is devoted to the discussion of the use of large or small areas as experimental plats.

In giving results of experiments to study the formation of sugar in beets it is noted that the individual root weight and actual sugar content continued to

increase throughout November and December, even though the lower leaves for a distance at 5 or 6 cm. (about 2 in.) on the stem had been removed, but that the average weight of the roots was less in cases when the leaves had been removed. The author concludes, therefore, that the sugar formation takes place regardless of the presence or absence of the leaves, and that this action must take place within the root.

Spacing experiment in sugar-beet cultivation in Hungary, 1912, B. von Jancsó (*Österr. Ungar. Ztschr. Zuckerindus. u. Landw., 43 (1914), No. 1, pp. 7–16*).—In row spacing varying from 14 to 18 in. and plant spacing varying from 8 to 10 in. the yield results from 19 fields showed a spacing of 10 by 14 in. to be most satisfactory.

Catalogue of the German division of the library of L. S. Ware on the sugar industry (*Katalog der Deutschen Abteilung einer Special-Bibliothek des Herrn L. S. Ware über die Zuckerindustrie. Courbevoie, France, [19–?], pp. 33*).—A bibliography of nearly 550 volumes, comprising the works on the sugar industry in the German language found in the private library of the late L. S. Ware (E. S. R., 29, p. 719).

Catalogue of the works on sugar and the sugar industry (*Katalog der Werke über Zucker und Zuckerindustrie. Locarno, Switzerland, 1914, pp. 70*).—This is an appendix of the above and includes over 400 volumes on sugar and the sugar industry in German, 11 in Danish, 50 in Spanish, 315 in Dutch, 13 in Hungarian, 58 in Italian, 9 in Bohemian, 6 in Latin, 11 in Polish, and 1 each in Roumanian, Russian, and Swedish, found in the library of the late L. S. Ware.

The "Stewart Cuban" variety of tobacco, H. K. Hayes (*Connecticut State Sta. Rpt. 1913, pt. 6, pp. 385–390, pls. 2*).—This article describes a new type of Cuban tobacco (E. S. R., 31, p. 43) which differed from the normal Cuban in having leaves of a somewhat lighter green shade and in being nearly free from basal suckers, the range of leaf counts being from 62 to 80. "This type bred true in 1913, and when compared with the normal Hazlewood Cuban gave an increase in packed yield of about 90 per cent. The quality of the cured leaves was also very satisfactory."

On the nitrogen content of the wheat kernel from trans-Volga districts, N. Tulaikov (*Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 15 (1914), No. 1, pp. 1–11; Bezenchuk. Selsk. Khoz. Opytn. Stantsiia, No. 48 (1914), pp. 11*).—Results of analyses show that there was little change in the nitrogen content of wheat varieties at the Bezenchuk station during 4 years of investigations. Difference in the nitrogen content of the wheat kernel is ascribed to the composition and osmotic pressure of the soil solutions under given climatic conditions, botanical variations in varieties playing no part.

Yams (Dioscorea), R. de Noter (*Agr. Prat. Pays Chauds, 13 (1913), Nos. 118, pp. 1–18, figs. 9; 119, pp. 146–160, figs. 6; 120, pp. 215–236, figs. 2*).—This article gives data on the origin, history, principal species, 23 cultivated varieties, and methods of cultivation of yams in Asia, Oceanica, North and South America, Africa, and Europe, with analyses and culinary preparations.

HORTICULTURE.

[Report of the] department of horticulture, W. L. Howard and J. C. Whitten (*Missouri Sta. Bul. 117 (1914), pp. 427–430*).—A progress report on horticultural investigations for the year ended June 30, 1913.

Three crops of apples have thus far been harvested from trees part of which were grown from scions selected from high-producing parents and part from trees of low-producing parents. There was practically as much variation in yield, size, and color of fruit between trees from the same parent as there was

between trees of different parentage. Bud selection from high-producing and from low-producing strawberries carried on through 12 previous years showed absolutely no gain in productiveness by selecting runners from high-producing parents.

Bordeaux mixture and lime-sulphur were found to be about equally effective against the ordinary diseases of the apple which occur in spring and summer, although the Bordeaux caused considerable damage from burning the fruit. Where lime-sulphur was substituted for Bordeaux as the calyx spray the injury was comparatively small. Arsenate of lead paste proved to be superior to arsenite of zinc in controlling the curculio and codling moth. The arsenite of zinc used in the quantities recommended by the manufacturers not only failed to control the insect but russetted the fruit and also scalded the leaves to a considerable extent. A demonstration spraying experiment conducted in a commercial orchard near Columbia resulted in a return, less cost of spraying, of $66.80 per acre for the sprayed fruit as compared with $5.50 per acre for the unsprayed fruit.

A study was made of fruit bud development as influenced by various treatments. Apple trees girdled in early June set a higher percentage of fruit buds than untreated trees of the same varieties without essentially injuring the growth of the trees. Other things being equal the tendency is for a heavy crop of apples to be followed by a light crop and for a light crop to be followed by a heavy crop. It has been shown that by proper cutting back water sprouts in both pears and apples can in one season be induced to produce both fruit spurs and fruit. In a comparison between fall versus spring planting of trees the increased growth through fall planting has decreased from about 100 per cent in the first season to 50 per cent in the second season and 33 per cent in the third season.

Observations relative to the self-fertility and self-sterility of peaches during the year have shown that all the leading commercial varieties grown on the station grounds are self-fertile. Since these results coincide with those previously secured it is concluded that the grower may safely plant even a single variety like the Elberta and expect the trees to set fruit. The self-fertile trees set as much fruit and the fruit develops as well as where varieties are cross-fertilized.

During the summer and fall of 1912 almost 200 species of seeds, representing 51 genera, were planted to determine whether seeds in general are capable of germinating immediately after ripening if placed under favorable conditions. The seeds of the grass, lily, pink, mallow, legume, and composite families seemed to have no rest period while the sedge, rose, cashew, and vine families have a pronounced rest period. In general seeds of woody plants have a more pronounced rest period and are more difficult to force into growth than seeds of vegetable and other herbaceous plants. Variation in the length and intensity of the rest period is greater between species than within a species. Etherization tended to stimulate seeds into an early growth and to increase the percentage of total germination. Soaked or stratified seeds are more strongly affected by ether than dry seeds. A 12-hour exposure to ether was the most favorable dosage for forcing seeds into germination.

In the orchard nutrition experiments none of the apple orchards responded to fertilizers applied during the past year. Peaches showed a notable response to an application of nitrogen, whether in the form of dried blood or nitrate of soda. Phosphorus and potash showed no appreciable influence upon the yield of fruit.

Report of the experimental work of the Taliparamba Agricultural Station for 1912–13, H. C. Sampson (*Dept. Agr. Madras, Rpt. Taliparamba Agr. Sta.,*

1912–13, pp. 12).—This report deals principally with the results of fertilizer and cultural experiments with peppers. Some data are also given on a variety test of sugar cane. An account of the locality and agriculture of the neighborhood of the Taliparamba Agricultural Station together with meteorological data and chemical analyses of sugar cane varieties are appended.

The manuring of market garden crops, B. DYER and F. W. E. SHRIVELL (*London, 1913, rev. ed., pp. 149, figs. 22*).—The present edition of this work (E. S. R., 24, p. 640) has been revised and brought up to date.

Third report on the partial sterilization of soils for glasshouse work, E. J. RUSSELL (*Jour. Bd. Agr. [London], 21 (1914), No. 2, pp. 97–116, pls. 2*).—In continuation of previous studies (E. S. R., 26, p. 815; 28, p. 538) experiments were conducted to determine the value of partial sterilization of soil in forcing houses. The crops worked with were tomatoes, cucumbers, and chrysanthemums. The results of preliminary outdoor experiments with wheat, barley, oats, and Swedish turnips are also reported.

The results as here presented indicate that partial sterilization of soil will give increased crops under the practical conditions of commercial forcing houses. The three heating methods tried out—high-pressure steam, low-pressure steam, and baking—all proved workable in practice and each has its advantages. Low-pressure steam was found to be the simplest method of heating soils in situ.

Partial sterilization effectually stamps out most of the diseases arising from the soil including club root. The supply of plant food is increased by partial sterilization, consequently less nitrogenous manure need be supplied to the plants in the early stages of their growth. Owing to the vigorous growth of tomato plants due to partial sterilization some difficulty was experienced with the setting of the fruit. It appears, however, that this can be avoided by adopting precautions as to varieties selected, size of plant at the time of setting out, withholding water and manure, and keeping on the heat.

It was found that old cucumber soil after being partially sterilized may be used again in making up borders. Since this soil has lost much of its fiber, however, it should be mixed with some new compost. In a similar manner old chrysanthemum compost may be used again after partial sterilization, provided a certain amount of new fibrous material is added.

Vegetable gardens on irrigated farms in western Nebraska, F. KNORR (*Nebraska Sta. Bul. 142 (1914), pp. 24, figs. 4*).—This bulletin discusses the general requirements for successful gardens under irrigated conditions and gives suggestions relative to the specific culture of different garden crops. The suggestions are based primarily on the results secured in the garden at the Scottsbluff Substation on the North Platte Irrigation Project.

[Culinary peas and miscellaneous vegetables at Wisley, 1913] (*Jour. Roy. Hort. Soc. [London], 39 (1914), No. 3, pp. 674–701, 713, 714*).—Data are given on a variety test of 217 stocks of garden peas, together with data on a number of miscellaneous vegetables tested at Wisley in 1913.

Chicory (Cichorium intybus), L. LAPICCIRELLA (*Staz. Sper. Agr. Ital., 46 (1913), No. 11–12, pp. 675–723*).—A monograph on chicory with reference to its history, cultivation, uses, and botany. A bibliography of consulted literature is appended.

Jack bean (Canavalia ensiformis), N. O. BOOTH (*Oklahoma Sta. Circ. 29 (1914), pp. 2, fig. 1*).—A descriptive account of this bean with special reference to its adaptation to Oklahoma conditions.

The fruits of Ontario (*Toronto: Ontario Dept. Agr., 1914, pp. 320, figs. 380*).—In the present edition of this work (E. S. R., 19, p. 842) a number of new varieties and new photographs have been included, and the descriptions of varieties and cultural directions have been brought up to date.

A selected list of hardy fruits, W. Wilks and G. Bunyard (*London: Roy. Hort. Soc., 1914, pp. 20*).—This comprises a selected list of orchard and small fruits for various sections of Great Britain, together with notes on cultivation and planting.

Promising new fruits, W. A. Taylor and H. P. Gould (*U. S. Dept. Agr. Yearbook 1913, pp. 109–124, pls. 8*).—In continuation of similar articles (E. S. R., 29, p. 436) historical notes with descriptions and color plates are given of the following new or little-known fruits which are believed to possess valuable characteristics which render them worthy of the attention of fruit growers: Banana, McCroskey, and Opalescent apples; Lizzie peach; Flowers and James grapes; Triumph persimmon; and Lue orange. The Boone chestnut is also described.

New or noteworthy fruits, II, U. P. Hedrick (*New York State Sta. Bul. 385 (1914), pp. 303–313, pls. 4*).—In continuation of a previous bulletin (E. S. R., 29, p. 838) the author describes some of the best recent fruit introductions as tested on the station grounds. These include King David apple, Edgemont peach, Abbesse d'Oignies cherry, French plum, Hicks grape, Chautauqua gooseberry, Chautauqua currant, and Indiana and Barrymore strawberries. Each variety is considered with reference to its history, important characteristics, and economic value.

Pollination in orchards.—III, Self-fruitfulness and self-sterility in apples, F. J. Chittenden (*Jour. Roy. Hort. Soc. [London], 39 (1914), No. 3, pp. 615–628*).—In continuation of a previous investigation (E. S. R., 31, p. 140), the author here presents the results of some experiments conducted at Wisley during the past few years.

About 5,000 clusters of flowers were bagged during the 3-year period 1911–1913. Data are given for each variety showing for the different seasons the relative amount of bloom and fruitfulness of the tree, number of fruits set in bags, and number of fruits harvested.

The results as a whole indicate that some varieties can form fruit without the aid of foreign pollen, whereas most of them appear to be sterile with their own pollen. Attention is called to the fact that there are many other causes of unfruitfulness in addition to lack of efficient pollination. Further experiments are to be conducted in an orchard house with the object of eliminating some of these disturbing factors. For cases in which apples are formed without the development of the seed, the author proposes the name "self-fruitful," restricting the term "self-fertile" to those cases where seed is produced.

A comparison of tillage and sod mulch in an apple orchard, U. P. Hedrick (*New York State Sta. Bul. 383 (1914), pp. 249–281, pls. 6, fig. 1*).—This is the second and final report on one of the station's 10-year tillage and sod mulch experiments, the results for the first 5 seasons having been previously noted (E. S. R., 21, p. 238).

During the first 5-year period of the experiment here described the orchard, comprising 239 trees, of which 118 were in sod and 121 under tillage, was divided into halves by a north and south line and during the last 5-year period by an east and west line. Hence one-quarter of the orchard has been tilled 10 years; another has been tilled 5 years and then left in sod 5 years; the third quarter has been in sod 10 years; and the fourth quarter in sod 5 years and then tilled 5 years.

The experiment is described in detail. The results as here summarized show an average yield on the plat left in sod for 10 years of 69.16 bbls. per acre as compared with 116.8 bbls. per acre on the plat tilled 10 years. The average cost per acre of growing and harvesting apples in sod was $51.73 as compared with $83.48 under tillage. After subtracting these figures from the

gross returns in each case, however, a balance of $140.67 per acre remains for the tilled plats as compared with $74.31 for the sodded plats. The fruit from the sod mulch plats was more highly colored and matured from one to three weeks earlier than the tilled fruit. The tilled fruit was found to keep from two to four weeks longer than the sodded fruit and was also better in quality, being crisper, juicier, and of better flavor.

The average annual gain in trunk diameter for the sod-grown trees was 2.39 in. as compared with 3.9 in. for the tilled trees. The tilled trees were uniform in growth whereas the sod-grown trees were lacking in uniformity. There were many more dead branches on the sodded trees and the new wood was not as plump or as bright in color. The leaves of the tilled trees came out 3 or 4 days earlier, they were larger, more numerous, a darker, richer green, and remained on the trees several days longer than those on the sodded trees.

In the quarter of the orchard grown in sod for 5 years and then converted to tillage the beneficial effects to tree and foliage were almost instantaneous. The yield likewise improved after the first year. A change for the worse was almost immediately observed in the quarter of the orchard which had been tilled for 5 years and was then grown in sod. The use of nitrate of soda in the sod plats greatly increased the vigor of the trees and was a paying investment, although for the 5-year period they bore but a trifle more than half as much as the tilled trees. A marked beneficial influence was observed in the case of sodded trees growing adjacent to ground under tillage.

Contrary to the results secured in the 10-year experiment in the Hitchings orchard (E. S. R., 31, p. 45), the quantities of humus and nitrogen in the plat tilled for 10 years were materially increased.

The author enumerates and discusses the following reasons why grass militates against successful apple growing: Lowering the water supply, decreasing some elements in the food supply, reducing the amount of humus, lowering the temperature of the soil, diminishing the supply of air, affecting deleteriously the beneficial microflora, and forming a toxic compound that affects the trees. The general conclusion is reached that grass is the chief cause of unprofitable orchards in New York.

Winter spraying with solutions of nitrate of soda, W. S. Ballard and W. H. Volck (*Prog. Agr. et. Vit. (Ed. l'Est-Centre), 35 (1914), Nos. 20, pp. 630–632; 21, pp. 648–653*).—A French translation of the authors' investigations which have been previously noted (E. S. R., 30, p. 640).

Citrus fruit handling and storage, A. W. McKay (*Proc. Fla. State Hort. Soc., 26 (1913), pp. 30–45*).—In this paper the author discusses the prevalence of blue mold decay in Florida citrus fruit during the 1912–13 season and concludes, in the light of experimental work conducted by the Bureau of Plant Industry for several years (E. S. R., 30, p. 841), that the decay was due to the unusually large crop with a consequent relaxing from careful methods of handling, combined with temperature and humidity conditions favorable for the development of the fungus in injured fruit.

In the discussion following O. W. Sadler presents some evidence to show that carefully dried fruit will tend to resist blue mold decay, even though injured.

During the season of 1912–13 the Bureau of Plant Industry commenced a cooperative investigation of the factors relating to grapefruit storage. The results for the first season, as here summarized, indicate that grapefruit may be held for 4 months in common storage with over 96 per cent of it in good commercial condition. Grapefruit stored, wrapped, and not washed has kept in the best condition in all the experiments. The quality of grapefruit is improved by storage, the chief attraction of stored fruit being a peculiar mellowness of flavor. Some evidence was obtained which indicated that there is also

an increase in the sugar content of stored fruit. The experiment has not been continued long enough to warrant any definite conclusions relative to a feasible and practical means of holding grapefruit.

Olive culture in Tunis, GUILLOCHON ET AL. (*Bul. Dir. Gén. Agr., Com. et Colon. Tunis, 18 (1914), No. 77, pp. 268–296*).—A cultural and statistical account of olive and olive oil production in Tunis.

A test of commercial fertilizers for grapes, U. P. HEDRICK and F. E. GLADWIN (*New York State Sta. Bul. 381 (1914), pp. 201–230, pl. 1*).—This bulletin reports a number of experiments which were conducted on a leased vineyard near Fredonia, N. Y., and also cooperatively in 6 vineyards in various parts of Chautauqua County in order to determine the value of commercial fertilizers in increasing or restoring former yields of grapes in the Chautauqua grape belt. The vineyards were selected to obtain fair averages of soils and of health and vigor of the grape plantations of this region. The experiments were conducted for a 5-year period, commencing in 1909.

The results of the experiment in the Fredonia vineyard have shown in brief that nitrogenous fertilizers had a marked beneficial effect upon the yield and quality of fruit, as well as upon leaf and wood growth. Lime had no appreciable effect in this vineyard and phosphorus and potassium had so small a beneficial effect that their use was not profitable. Hence it is concluded that nitrogen is the limiting factor.

The cooperative experiments were less conclusive. Commercial fertilizers, stable manure, and green manure crops were all used and the results vary greatly in any one vineyard or in the several vineyards compared with one another. The data obtained indicate that the fertilization of vineyards is so involved with other factors that only long-continued work will give reliable results.

The authors recommend that the following steps be taken in restoring the failing vineyards: Good drainage, control of insects and fungi, improvement in tillage and general care, and the application of such fertilizers as may be found lacking by actual test.

Bibliotheca vinaria, A. L. SIMON (*London, 1913, pp. VIII+340*).—A bibliography of books and pamphlets dealing with viticulture, wine making, distillation, and the management, sale, taxation, use, and abuse of wines and spirits.

The history and development of the strawberry, E. A. BUNYARD (*Jour. Roy. Hort. Soc. [London], 39 (1914), No. 3, pp. 541–552, pls. 8*).—A review of the literature of the subject, including a bibliography of the most important works on the strawberry.

Classification of the genus Annona, with descriptions of new and imperfectly known species, W. E. SAFFORD (*U. S. Nat. Mus., Contrib. Nat. Herbarium, 18 (1914), pt. 1, pp. XII+68, pls. 41, figs. 75*).—This bulletin embraces a synoptical view of the genus Annona by natural groups and sections with descriptions of additional new or inadequately known species. Descriptions are also given of two closely allied new genera, Fusaea and Geanthemum, together with critical notes upon Rollinia, Duguetia, and Raimondia.

Mango crops, and some factors influencing them, A. C. HARTLESS (*Agr. Jour. India, 9 (1914), No. 2, pp. 141–159*).—A survey of mango production at the Government Botanical Gardens, Saharanpur, based upon information found in old reports for a period of 27 years. From these data the author makes deductions relative to factors influencing mango crops.

Control of imported tea seed, C. BERNARD and J. J. B. DEUSS (*Indian Tea Assoc., Sci. Dept. Quart. Jour., No. 1 (1914), pp. 1–23, figs. 6*).—An English translation of a report previously noted (E. S. R., 30, p. 742).

Analyses of materials sold as insecticides and fungicides (*New York State Sta. Bul. 384 (1914), pp. 283–302*).—This comprises data on the guarantied and found analyses of samples of materials sold as insecticides and fungicides which were collected in different parts of the State.

Practical tree surgery, J. F. COLLINS (*U. S. Dept. Agr. Yearbook 1913, pp. 163–190, pls. 7*).—In this article the author describes the various parts of the tree and their functions, together with the methods employed in the renovation of injured and decayed trees. Suggestions are also given relative to precautions to be taken by tree owners when employing commercial tree surgeons to attend their trees.

Plants, etc., certificated by the [Royal Horticultural] Society from 1859 to 1910, inclusive (*London: Roy. Hort. Soc., 1911, pp. 195*).—This comprises a list of all the fruits, vegetables, decorative plants and flowers, ferns, daffodils, and tulips to which the Royal Horticultural Society of England has granted certificates from the year 1859 to the end of 1910, with the exception of purely florists' flowers certificated previous to 1890, many of which have been superseded and have become obsolete.

[Antirrhinums and miscellaneous flowering plants at Wisley, 1913] (*Jour. Roy. Hort. Soc. [London], 39 (1914), No. 3, pp. 635–656, 665–673*).—Descriptive notes are given on some 207 stocks of antirrhinums and on a large number of miscellaneous flowering plants tested at the Wisley Gardens in 1913.

Decorative garden dahlies at Duffryn, near Cardiff (*Jour. Roy. Hort. Soc. [London], 39 (1914), No. 3, pp. 657–664*).—Descriptive notes on a large number of varieties of dahlias tested on behalf of the Royal Horticultural Society and the National Dahlia Society of England are given.

Garden design, E. WHITE (*Jour. Roy. Hort. Soc. [London], 39 (1914), No. 3, pp. 559–580, pls. 12*).—This comprises the substance of two lectures on garden design, delivered before the Royal Horticultural Society.

The commuter's garden, edited by W. B. HAYWARD (*New York, 1914, pp. VII+219, pls. 16*).—A popular work dealing with vegetable and ornamental gardening in the suburbs, including suggestions relative to poultry raising, bee keeping, etc.

Identifying plants without a key, S. F. HAMBLIN (*Boston, 1914, pp. 25, figs. 50*).—In this pamphlet the author calls attention to interesting points in botanic difference or relation that apply to the twigs, buds, leaves, flowers, fruit, or specific peculiarities of various trees, shrubs, and herbs, and which will be of assistance in placing the plants in their proper families.

FORESTRY.

Report of the forestry committee of the Fifth National Conservation Congress at Washington, D. C., November 18–20, 1913 (*Rpt. Forestry Com. 5. Nat. Conserv. Cong., 1913, pp. 397, pl. 1*).—This report, which also includes those of the various subcommittees of the forestry section, deals with the following subjects: Publicity, forest planting, state forest policy, forest taxation, forest school education, forest investigations, lumbering, forest utilization, forest fires, and federal forest policy. The resolutions on forestry adopted by the congress are given and the following addresses are also included: Federal Forestry, by H. S. Graves (pp. 360–365); Economic Factors in Private Forestry Work, by E. A. Sterling (pp. 366–377); Public Knowledge of Forest Economics, by E. T. Allen (pp. 378–384); Conservation of Life in the Lumber Camps, by Mabel T. Boardman (pp. 385–389); The Lumberman's Point of View, by J. E. Rhodes (pp. 390–394); Lumbermen and Forestry, by W. Irvine

(pp. 395, 396); and What the Conservation Congress Accomplished, by C. L. Pack (p. 397).

Seventh report of the state forester of Connecticut, W. O. FILLEY (*Connecticut State Sta. Rpt. 1913, pt. 6, pp. 391–420, pls. 2*).—In view of the detailed report on the work of the forestry department which appeared in the station report for 1912 (E. S. R., 29, p. 546) the report on the work for 1913, here presented, is confined to a paper on A Preliminary Working Plan for the Portland State Forest, by W. O. Filley and A. E. Moss, and tabular data as to forest fires in Connecticut during 1913. This forest is described in detail and discussed with reference to its silvicultural treatment, administration, fire protection, division of area, and revision of working plan. The compartments and subcompartments of the forest are described in detail.

Forest statistics at the beginning of the nineteenth century, H. DE COINCY (*Rev. Eaux et Forêts, 53 (1914), Nos. 9, pp. 281–288; 10, pp. 313–320*).—The author here presents a statistical account of forest conditions in France during the early years of the nineteenth century.

The administration of a forest experiment station, G. A. PEARSON (*Forestry Quart., 12 (1914), No. 2, pp. 211–222*).—A discussion of this subject based on the author's experience of 5 years as director of the Fort Valley Experiment Station, and here presented with the view of stimulating discussion from other experiment stations and the U. S. Forest Service in general.

A proposed method of preparing working plans for National Forests, J. C. KIRCHER (*Forestry Quart., 12 (1914), No. 2, pp. 145–157*).—The author discusses the main reasons for the failure of past plans of the Forest Service and describes the proposed plan to be tried out on the National Forests during 1914 before being put into effect.

Reforesting cut-over chestnut lands, E. C. M. RICHARDS (*Forestry Quart., 12 (1914), No. 2, pp. 204–210*).—The author here presents the results of a study of the conditions found on various types of cut-over chestnut lands in northern New Jersey, and offers brief suggestions relative to reforesting these lands.

A mechanical tree planter, F. T. MCLEAN (*Forestry Quart., 12 (1914), No. 2, pp. 139, 140, figs. 3*).—The author here illustrates and describes a mechanical tree planter which gives promise of planting forest trees more rapidly and as well as a man with a mattock can do it. The machine is specially adapted to plant tap-rooted conifers on rough, brushy lands, and burns.

Design of a range finder, L. CROWELL (*Forestry Quart., 12 (1914), No. 2, pp. 137, 138, pl. 1*).—A description and an illustration is given of a range finder for forest lookout stations which is said to be quite accurate and cheaply and easily constructed.

A new measuring instrument, H. W. SIGGINS (*Forestry Quart., 12 (1914), No. 2, pp. 141–144, fig. 1*).—The instrument illustrated and described consists of a combination of the Biltmore stick, the Christen hypsometer, and the Doyle rule in a single stick. Scales are given for constructing the Biltmore stick and the Christen hypsometer in connection with any log rule which will fulfill the requirements for a particular section.

Errors in estimating timber, L. MARGOLIN (*Forestry Quart., 12 (1914), No. 2, pp. 167–176*).—A discussion of the sources of error in timber estimating, with special reference to errors involved in making an estimate on only a small part of the area.

Stem analyses, J. BENTLEY, JR. (*Forestry Quart., 12 (1914), No. 2, pp. 158–166, fig. 1*).—The object of the present discussion is to recommend a more logical tabulation of the data usually included on a stem analysis blank as recorded in this country.

The scope of dendrology in forest botany, H. DE FOREST (*Forestry Quart., 12 (1914), No. 2, pp. 228–237*).—The author here presents a short critical analysis of the subject of dendrology.

The silvical and economic geographic importance of the valonia oaks, K. BURK (*Jahrb. Nassau. Ver. Naturk., 66 (1913), pp. 1–52, pls. 2*).—An account of the distribution, habitat, exploitation, and economic importance of the valonia oaks in the Mediterranean region, with a bibliography of cited literature.

Note on tapping experiments with Funtumia elastica, conducted at Musa and Kutu, Belgian Kongo, A. GISSELEIRE (*Bul. Agr. Congo Belge, 5 (1914), No. 1, pp. 95–104, figs. 6*).—In the tapping experiments conducted at Musa some 1,696 Funtumia trees, ranging from 7 to 9 years of age and tapped for a period of about 3 weeks, yielded an average of 105 gm. of fresh rubber per tree, including the scrap rubber. In the Kutu tapping experiments some 1,368 trees, ranging in age from 6 to 9 years, yielded about 123 gm. of fresh rubber per tree, including the scrap.

Hevea in Cochin China, E. GIRARD (*Bul. Écon. Indochine, n. scr., 17 (1914), No. 106, pp. 46–53; Jour. Agr. Trop., 14 (1914), Nos. 154, pp. 97–100; 155, pp. 129–132*).—This comprises a general discussion relative to the adaptability of Hevea rubber to the soils and climate of Cochin China, cultural operations, and methods of exploitation.

Exploitation of cross-ties in northern New Mexico, C. F. KORSTIAN (*Forestry Quart., 12 (1914), No. 2, pp. 177–192*).—Data on the various operations in the exploitation of cross-ties, based on the methods employed by one company which had been operating for the past 6 years in northern New Mexico, are here given and discussed.

DISEASES OF PLANTS.

The biological basis of international phytopathology, W. A. ORTON (*Phytopathology, 4 (1914), No. 1, pp. 11–19*).—An outline is given of what the author considers the fundamental principles upon which successful international action for the control of plant diseases should be based.

Report of the botany department, G. M. REED (*Missouri Sta. Bul. 117 (1914), pp. 420, 421*).—Brief summary reports are given of the investigations carried on during the fiscal year ended June 30, 1913.

The work of the year has conclusively shown that the loose smut of barley and wheat can be completely controlled by the hot water treatment and that when once eradicated from fields it will not reappear unless introduced from the outside. As a result of a manuring experiment about 70 per cent smutted plants were obtained affected with loose smut of oats.

The results of the investigation on the effect of toxic substances on soil organisms are summarized, showing that the detrimental or beneficial effect of toluol or carbon bisulphid upon nitrate accumulation in soils depends (1) upon the acting strength of the chemical in question, and (2) upon whether the soil is exposed for the chemical to evaporate. Toluol in strengths approximating 0.1 cc. per 100 gm. of soil was found to exert no appreciable effect upon nitrification. If the strength exceeds this, it may, and usually does, exert a detrimental or even inhibitory effect upon the process for short periods of incubation. However, if the periods of incubation are extended the harmful effect is overcome with strengths up to and including 1 cc. per 100 gm. of soil. In strengths of less than 1 cc. per 100 gm. of soil carbon bisulphid, even for short periods of incubation, did not show any appreciable effect upon nitrate accumulation. If the strength of carbon bisulphid exceeded 1 cc. per 100 gm.

a temporary retarding effect was observed, but this was soon overcome even when the treatment was as strong as 5 cc. per 100 gm. of soil. It was found that samples of soil treated with either chemical in sufficient quantity to inhibit entirely nitrification for a period of from 4 to 20 weeks may entirely recover from the effect with reinoculation. So far as the laboratory experiments can be applied to field practice, it is thought that neither toluol nor carbon bisulphid as previously used could materially affect nitrate accumulation, since practical applications rarely exceed 0.1 cc. per 100 gm. of soil.

Preliminary to a study of the parasitic flora, the local rusts have been studied and about 400 collections made of 70 different species.

In experimental work with the powdery mildew on oats, it was found that this species will not pass over to wheat, barley, rye, or other grasses tested, although it does infect the tall wild oats (*Arena elatior*). In studying the effect of light, it was found that etiolated plants will not become infected, even though normal green plants of the same varieties are extremely susceptible to the mildew.

Report of the central station for plant protection in Mecklenburg-Schwerin and Mecklenburg-Strelitz, 1912. H. ZIMMERMANN (*Ber. Hauptsammelstelle Pflanzenschutz Mecklenburg-Schwerin u. Strelitz, 1912, pp. 121*).—Beginning with an account of the weather during each month of 1912 in connection with crops or other vegetation affected thereby, this report then deals in considerable detail with diseases of various field and forest plants and with other enemies thereof, giving in some cases comparisons with data obtained in previous years.

Heat killing and stem constrictions of plants. C. VON TUBEUF (*Naturw. Ztschr. Forst u. Landw., 12 (1914), No. 1, pp. 19–36, figs. 4*).—This is a discussion of notes by the author and others on growth and behavior of woody plants as influenced by parasitic fungi, compression (from binding), extreme dryness, heat, etc., including studies in regions subject to extremes on several continents.

The fungus genus Verticillium in its relation to plant diseases. W. A. ORTON (*Abs. in Phytopathology, 4 (1914), No. 1, pp. 40, 41*).—In a previous publication (E. S. R., 30, p. 649) the author called attention to a disease of potatoes caused by *V. alboatrum*. It is now reported that a similar fungus occurs on eggplants, causing a serious wilt disease.

Of two wilt diseases of okra, one is said to be due to *Fusarium vasinfectum*, the other to *V. alboatrum*. The Verticillium is in general said to be more northern in its range than the Fusarium wilt of okra.

Diseases of dahlia in Germany and seedling maples in Schleswig-Holstein are associated with Verticillium.

Studies on Nectriaceæ, II. J. WEESE (*Ztschr. Gärungsphysiol., 4 (1914), No. 2, pp. 90–132, figs. 2*).—The report previously noted (E. S. R., 31, p. 242) is followed by a critical discussion of *Nectria peziza*, *N. suffulta*, *N. hæmatites*, *N. cucurbitula meizospora*, *N. pityrodes*, *N. crinacea*, and *N. heterosperma*. In connection with the treatment thereof notes by numerous other authors are cited.

Snow mold and other aspects of attack by Fusarium nivale on cereals. E. SCHAFFNIT (*Landw. Jahrb., 43 (1913), No. 4, pp. 521–648, pls. 5*).—This is a more detailed account (E. S. R., 29, pp. 244, 445) of studies by the author with *F. nivale*, including its relations with the host plant in its three stages (on leaves of young plants in early spring, on stems before maturity, and on grains thereafter). Discussion is given also of its cultural and other characters and behavior in connection with those of other related or other grain infecting fungi, also of measures for its control. The last mentioned include selection

of resistant varieties, dipping of seed grain, field treatment by means of fertilizers, etc.

The results are presented in considerable detail, largely in tabular form, and a critical description of *F. nivale* is also given.

Smut in small grains, H. D. HUGHES and P. C. TAFF (*Iowa Sta. Circ. 11 (1913), pp. 4*).—A description is given of smuts of small grains, the authors stating that in Iowa loose smut of oats is most prevalent, with covered smut or stinking smut of wheat as second in importance.

For the control of these diseases the authors recommend the formalin treatment for the smut of oats, stinking or covered smut of wheat, and covered smut of barley, and for treatment of loose smut of wheat and barley a modified hot water treatment which consists of soaking the seed for 4 or 5 hours in cold water, after which it is placed in hot water for 10 to 13 minutes.

Investigations of timothy rust in North Dakota during 1913, W. H. MERCER (*Phytopathology, 4 (1914), No. 1, pp. 20–22*).—Timothy rust (*Puccinia phleipratensis*) is said to have become prevalent and very destructive in various parts of North Dakota. Some investigations are reported, in which the author undertook to determine a possible æcidial host and the relation of this rust to the rusts on various cereals and grasses. Field observations supplemented by laboratory and greenhouse work were carried on with a number of rusts which showed that there is apparently no relation between grain and timothy rusts and probably none between the rust on the timothy and that on other grasses studied.

Heart rot of beets, J. KÄPPELI and O. MORGENTHALER (*Landw. Jahrb. Schweiz, 27 (1913), No. 8, pp. 432–435, pl. 1, fig. 1*).—An account is given of a case in which it is claimed that dust from passing vehicles, etc., was responsible for a great local increase of injury to beets affected with heart rot (*Phoma betæ*) along a roadside by its effects in clogging the stomata on the upper leaf surfaces and thereby reducing the vitality of the plants.

The employment of less susceptible varieties, also the protection of the beet crop by planting other and nonsusceptible crops between the beet plants and dusty roadside are recommended.

The heart rot is said to be communicated by beets infected in the field to sound roots in storage.

Celery disease (*Gard. Chron., 3. ser., 55 (1914), No. 1418, p. 150*).—It is stated that the celery crop of 1913 under nearly the same conditions as that of 1912, with the exception that artificial watering was necessary, showed late blight in August. Copper sprays had but little effect except at first. It is held that manuring had little if any influence on the disease, but that dry weather and artificial watering probably are more influential in this regard.

Cotton anthracnose, H. R. FULTON, J. R. WINSTON, and R. O. CROMWELL (*Abs. in Phytopathology, 4 (1914), No. 1, p. 42*).—A description is given of the cotton anthracnose which is said to be a recent introduction into North Carolina. The topics considered by the authors are the introduction of the fungus, its local spread, factors influencing seasonal development, susceptibility of varieties, and the effectiveness of seed selection for the control of the disease.

Fruit rots of eggplant, F. A. WOLF (*Abs. in Phytopathology, 4 (1914), No. 1, p. 38*).—The author reports a study of the morphology and cultural characters of *Ascochyta hortorum*, which causes a rot of the fruit of eggplant.

In addition there is reported an undescribed fruit rot due to a species of Rhizoctonia, which cultural studies indicate is identical with *Corticium vagum solani*. The fungus is said to excrete an enzym, pectinase, which causes the dissolution of the middle lamellæ and the consequent disintegration of the tissues.

Is golden seal resistant to the root knot nematode? J. A. McClintock (*Phytopathology, 4 (1914), No. 1, p. 33*).—An investigation was made to determine the accuracy of the popular belief that golden seal is not liable to attack from root knot nematodes and may, therefore, be grown in infested ginseng beds.

It was found that golden seal plants from Tennessee and from Michigan were badly infected with nematodes, indicating that this plant can not be used to starve out nematodes in infested ginseng beds.

Report of 1913 infection studies with Fusarium on potato, W. Himmelbaur (*Österr. Ungar. Ztschr. Zuckerindus. u. Landw., 43 (1914), No. 1, pp. 1–6*).—Reporting detailed results of further studies (E. S. R., 30, p. 539), the author states that wound infection with *Fusarium subulatum*, *F. rubiginosum*, *F. falcatum*, and *Verticillium alboatrum*, also with Fusarium taken from several designated varieties of potato, produced disease symptoms similar to those of leaf roll.

A Phoma rot of Irish potatoes, I. E. Melhus (*Abs. in Phytopathology, 4 (1914), No. 1, p. 41*).—A report is given of a new storage rot observed prevalent on potatoes grown in Maine. The disease is believed to be due to a species of Phoma, which causes depressed circular areas from 0.5 to 3 cm. in diameter and often extend into the center of the tuber. The results so far as reported indicate that the fungus is a wound parasite most destructive on potatoes in storage.

Inspection and certification of potato seed stock, W. A. Orton (*Abs. in Phytopathology, 4 (1914), No. 1, pp. 39, 40*).—The author outlines a plan for the inspection and certification of potatoes, the certificate to be based on field inspections supplemented by inspection of the tubers prior to shipment. The presence of powdery scab, wart, nematodes, Fusarium wilt, Verticillium wilt, southern brown rot, and leaf roll should disqualify potatoes from certification. The presence of other diseases should receive special consideration.

Relation of the mosaic of the pepper and the filiform leaf of the tomato to the mosaic of the tobacco, C. A. Schwarze (*Abs. in Phytopathology, 4 (1914), No. 1, p. 42*).—The characters of the mosaic disease of the pepper are said to be practically the same as those shown by similarily affected tobacco. On the tomato the disease is less well known. Here it takes a form called filiform leaf, causing the reduction of the size of the leaf and frequently reducing it to nothing but a midrib. The blossoms are also affected, branching is excessive, and the fruit production is greatly reduced. Small portions of diseased pepper and tomato leaves inserted into healthy tobacco plants soon developed the disease. Attention is called to the difference in susceptibility of varieties to this trouble.

A new rust of economic importance occurring on pomaceous hosts, H. S. Jackson (*Abs. in Phytopathology, 4 (1914), No. 1, p. 41*).—A description is given of the occurrence of an Æcidium on the pear and quince in Oregon, foliage, fruit, and stems being attacked and frequently causing considerable distortion. This is believed to be the same rust as that occurring on the apple, crab apple, etc. The Æcidium agrees on all the hosts with *Æ. blasdaleanum*. Although cultural proof is lacking, the author believes the Æcidium is connected with *Gymnosporangium blasdaleanum*. If this should be true, most of the plants upon which it has been observed are unrecorded hosts for this species.

An unusual outbreak of apple blossom blight, G. M. Reed (*Phytopathology, 4 (1914), No. 1, pp. 27–30*).—The author reports an unusual occurrence of blossom blight on apple trees in Missouri in 1913. An examination was made of orchards in the vicinity of Columbia, showing that some varieties were entirely free from the blight while others showed varying degrees of the infection. The

blossom blight was very common on the pear trees in the same orchard and twig blight was also conspicuous. An examination of wild crab and haw trees in the vicinity revealed the presence of a large percentage of blighted flower clusters. This was particularly true of *Crataegus crus-galli*.

As an explanation of the unusual outbreak of blossom blight it is suggested that the absence of severe cold weather may have favored the survival of the blight bacteria in cankers. The trees did not come into bloom until two weeks later than usual. At this time insects were much more abundant than usual and may have served as carriers for the bacteria.

Collar blight of apple trees in Pennsylvania, C. R. ORTON and J. F. ADAMS (*Abs. in Phytopathology, 4 (1914), No. 1, p. 43*).—Collar blight or collar rot, as the disease is said to be locally known, was first reported in Pennsylvania in May, 1907. Since that time it has spread rapidly throughout the State as well as in neighboring States and is considered one of the most serious apple diseases with which the orchardist has to contend. The disease appears distinct from the crown rot in New York, which is due to winter injury. It is considered definitely established that the trouble is due to *Bacillus amylovorus*, and the apple tree borer is considered one of the most active agents in the spread of the causal organism.

The use of sulphur-lime wash as a remedy for apple scab, R. K. BEATTIE (*Abs. in Phytopathology, 4 (1914), No. 1, p. 42*).—A résumé is given of 5 years' spraying experiments at the Washington Experiment Station, in which an attempt was made to overcome the injury following the use of Bordeaux mixture. This, it is said, was secured by the use of lime-sulphur. Experiments showed that if properly applied twice during the season, practically perfect results were given, as high as 99.17 per cent of the fruit being free from scab, while in the unsprayed check not more than 6 per cent of the fruit was unaffected. Attention is called to the necessity for thoroughness in spraying and the value of spraying under heavy pressure for attaining the best results.

Control of Cronartium rust on currants, R. EWERT (*Ztschr. Pflanzenkrank., 23 (1913), No. 8, pp. 463–476, figs. 2*).—Experiments in 1912 and 1913 are described. It is claimed that while the black currant is ordinarily infected almost exclusively from below, a slight benefit appears to be derived from spraying the upper leaf surface with Bordeaux mixture of 1 per cent strength.

Control of Cronartium rust on currants, R. EWERT (*Jahresber. Ver. Angew. Bot., 11 (1913), pt. 1, pp. 30, 31*).—This gives in condensed form the substance of the article above noted.

Practical formulas for the treatment of grape anthracnose, L. DEGRULLY (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 35 (1914), No. 2, pp. 33–38, fig. 1*).—It is claimed that a spray containing 8 parts of sulphuric acid and from 10 to 15 of iron sulphate to 100 of water is more adherent and therefore more lasting in its effects than those of the more common composition.

Peronospora disease of grapevines and its control, K. MÜLLER (*Grossh. Bad. Landw. Vers. Anst. Augustenb. Flugbl. 1 (1913), pp. 12, figs. 5;* in *Ber. Grossh. Bad. Landw. Vers. Anst. Augustenb., 1912*).—An illustrated description is given of *P.* (*Plasmopara*) *viticola* in relation to leaves, blooms, and berries in connection with other grape diseases or influences producing results somewhat resembling those of this parasite. The history of its development is traced in relation to weather and to effects on the vine stock. Protective measures are discussed, including control of general culture conditions and sprays with their effect on the crop and stock.

Studies with Plasmopara viticola on grapevines, G. VON ISTVÁNFFI and G. PÁLINKÁS (*Ztschr. Pflanzenkrank., 23 (1913), No. 8, pp. 449–463*).—This contribution is in the form of a report on about 70 investigations with discussion

thereof, relating to the invasion of grape leaves by *P. viticola* and its development therein, and dealing with the incubation period, oil spots, conidiophores, conidia and swarm spores, infection, stomatal relations, etc.

Identity of the American and French mulberry blight, E. F. SMITH (*Phytopathology, 4 (1914), No. 1, p. 34*).—As the result of studies of leaves and stems of mulberry from France and a comparison of the cultural characters of *Bacterium mori*, the author was led to the conclusion that the same organism is responsible for the disease in both America and France.

Diseases and pests of cultivated plants in Samoa, K. GEHRMANN (*Arb. K. Biol. Anst. Land u. Forstw., 9 (1913), No. 1, pp. 1–72, figs. 11*).—Discussing in general the cultural conditions prevalent in Samoa, more particularly as related to diseases of cacao, the author reviews briefly the history, modes of attack, etc., of cacao canker with an account of studies thereon by others.

He concludes from his own investigations that *Fusarium samoense* n. sp. is the cause of this disease, a Nectria and a Calonectria being found in connection apparently as saprophytes. The canker is said to be spread largely by surface drainage of the soil. Admission of air and sunshine and employment of radical pruning and fungicides are recommended. Some other diseases of cacao with alleged causal organisms are briefly discussed. Among other injurious agents noted are sulphurous volcanic gases, lightning, etc.

A bibliography is appended.

Cladosporium diseases of Ampelopsis tricuspidatum, M. T. COOK and G. W. WILSON (*Abs. in Phytopathology, 4 (1914), No. 1, p. 42*).—A disease of this ivy due to *C. herbarium* is described. The organism is said to penetrate the stems, causing a hypertrophy and resulting in the death of the vine. It is said that the same fungus has been observed on grapes in California and in Europe. During the past season it was reported common in New Jersey, where it caused a great deal of injury.

Stem rot and leaf spot of Clematis, W. O. GLOYER (*Abs. in Phytopathology, 4 (1914), No. 1, p. 39*).—A description is given of a stem rot and leaf spot of Clematis due to *Ascochyta* sp. The fungus is said to live as a saprophyte on the stem stub of the previous year and to produce numerous pycnidia. It works slowly downward to the new shoots, which become girdled, the portions above suddenly wilting. The same fungus has been observed causing a leaf spot of *C. paniculata*. The disease has been produced artificially by inoculating with pure cultures of Ascochyta, and by spraying with spores from pure cultures.

Latent phases of disease following infection of Euphorbia cyparissias with Uromyces, G. TISCHLER (*Bot. Jahrb. [Engler], 50 (1914), Sup., pp. 95–110, figs. 7*).—Previous work (E. S. R., 26, p. 650) has been followed up by a further study of *E. cyparissias* infected with *U. pisi*.

It is stated that by a treatment preventing the occurrence of the usual winter resting period of the host it is possible to prevent the development of the fungus on the young foliage and stems. The disease remains latent in such plants, ready to break out on reestablishment of the regular resting period, as in the ordinary life cycle of the host. In the latent condition of this fungus thus induced the mycelium appears unable to make its way between the meristematic cells of the growing point, although it may be present between the vacuolated cells into which it sends typical haustoria. The observed variations in activity of the parasite, it is thought, may be related to differences in osmotic pressure in plant and parasite, as noted by MacDougal (E. S. R., 26, p. 433). It is stated that even when the fungus is apparently absent from growing points of the leaves of a given shoot, the parasite may appear in the floral organs later developed, causing a characteristic deformation thereof.

A bibliography is given.

Heat injuries to forest plants, E. MÜNCH (*Naturw. Ztschr. Forst u. Landw., 11 (1913), No. 12, pp. 557–562, figs. 2*).—In a preliminary statement of studies regarding the injurious effects of heat on young forest trees, descriptions and illustrations are given of injuries to young beeches and pines, as noted in the dry, hot summer of 1911. Fungi found in connection therewith are thought to have played the part of saprophytes merely. Temperatures of from 50 to 55° C. (122 to 131° F.) at the surface of sandy soil are said to have been common during that time. It is thought that such temperatures may prove directly fatal to young plants independently of their drying influence. Protection against direct sunshine is said to prevent this sort of injury. Raw humus is most favorable to heat injury and loose sand almost as much so, the latter being found in one case to be 16° hotter than compact sand, on account of its poor conductivity.

Injury from air exclusion and overheating, C. VON TUBEUF (*Naturw. Ztschr. Forst u. Landw., 12 (1914), Nos. 2, pp. 67–88, figs. 2; 4, pp. 161–169*).—Detailing methods pursued and results obtained in experiments continued for two years with artificial or solar heat applied to the trunks or roots of *Fraxinus excelsior* or *F. americana*, the author states that stems were usually injured or killed by long exposure to 42° C. (107.6° F.). Exclusion of air by means of paint, etc., seemed to exert less influence than did high temperature.

More on heat injuries to forest plants, E. MÜNCH (*Naturw. Ztschr. Forst u. Landw., 12 (1914), No. 4, pp. 169–188*).—Following the two contributions noted above, the author gives a fuller discussion of observations made on heat transference by absorption, radiation, conduction, and convection in relation to plants, also of such modifying factors as moisture, nature and state of the soil, etc. The suggestion is made that in these studies more exact means be employed to ascertain the temperature of the plant itself, as this is always lower than that of the adjacent soil at the surface under such circumstances.

Notes on diseases of trees in the southern Appalachians, II, A. H. GRAVES (*Phytopathology, 4 (1914), No. 1, pp. 5–10, pl. 1, fig. 1*).—In continuation of an account of diseases in the southern Appalachians (E. S. R., 29, p. 851), the author gives brief descriptions of the more important fungus diseases observed on the scrub pine (*Pinus virginiana*).

The most prevalent diseases are said to be the burl caused by *Cronartium quercus*, heart rot due to *Tramctes pini*, and a leaf cast (*Gallowaya pini*). A second disease of the needles caused by *Colcosporium inconspicuum* is said to be rather rare. Among other injuries to the pine trees a description is given of the damage done by wind, ice, and snow, and unfavorable soil conditions.

Notes on Peridermium from Pennsylvania, C. R. ORTON and J. F. ADAMS (*Phytopathology, 4 (1914), No. 1, pp. 23–26, pl. 1*).—From a recent study of some Peridermiums occurring on various species of pine, the authors conclude that the form associated with *Cronartium comptoniæ* should be called *P. comptoniæ* n. comb., that *C. comandræ* is the alternate stage of *P. pyriforme*, and that the Coleosporium occurring on Aster and Solidago has for its æcidial stage *P. acicolum*. In the course of the investigations *P. acicolum* was found on *Pinus pungens* in addition to the usual host species.

Notes on the white pine blister rust, P. SPAULDING (*Abs. in Phytopathology, 4 (1914), No. 1, pp. 41, 42*).—In continuation of a previous report on this blister rust (E. S. R., 29, p. 554) the author gives an account of its occurrence on white pine in New York, near where it was first reported (E. S. R., 18, p. 747), and also in northern Vermont. In Vermont a large white pine tree fully 75 years old was found badly infected and a number of younger trees were also diseased. The fungus has been definitely reported in Denmark as occurring

on *Pinus excelsa* and during the past year it was found several times on this same host in this country. The author states that inspection records show that in but one case have all the diseased white pines been removed upon the first inspection.

A preliminary note on the cause of "pecky" cypress, W. H. LONG (*Abs. in Phytopathology, 4 (1914), No. 1, p. 39*).—The author reports the discovery of the sporophores of a fungus associated with what is popularly known as pecky cypress. The fungus is apparently *Fomes geotropus*, a tropical species closely related to *F. ulmarius*. It enters through a wound at the butt of the tree and produces hollows which may or may not terminate in a pecky condition further up the tree. The fungus was found directly associated with the diseased condition in five localities in Florida, two in Louisiana, and one in Arkansas. In addition to occurring on the cypress it was found associated with hollows in the butts of living trees of tupelo gum, black gum, sweet gum, elm, maple, and magnolia.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

The American thrushes valuable bird neighbors (*U. S. Dept. Agr. Yearbook 1913, pp. 135–142, pl. 1*).—This article, prepared from data furnished by F. E. L. Beal, calls attention to the economic importance of the robin, bluebird, and other members of the thrush family.

The food of Rana pipiens, C. J. DRAKE (*Ohio Nat., 14 (1914), No. 5, pp. 257–269*).—This report of investigations of the food of the common leopard frog (*R. pipiens*) and its relation to nature in the neighborhood of its habitat is based upon dissections of 209 specimens collected on the peninsula of Cedar Point, Ohio. It is stated that the frog's food consists only of living and moving creatures and that very little vegetable matter was found in its stomach. A detailed tabulation of the findings, including determinations of many of the insects, is presented.

The dictionary of entomology, N. K. JARDINE (*Ashford, England, [1913], pp. IX+259*).—The author has compiled and explained technical and special terms used by writers in entomology from the time of Linné to the present date and has given their derivations. Some 3,000 scientific terms are thus brought together.

The writings of Philip Reese Uhler (*Proc. Ent. Soc. Wash., 16 (1914), No. 1, pp. 4–7*).—This is a list arranged chronologically of Dr. Uhler's entomological contributions, which largely relate to the Hemiptera.

Bringing applied entomology to the farmer, F. M. WEBSTER (*U. S. Dept. Agr. Yearbook 1913, pp. 75–92, pls. 6, figs. 4*).—This popular article discusses ancient misconceptions regarding insects, early records of insect depredations in America, the primitive state of entomology at that time, first efforts for the protection of plants from insects, beginnings of the application of entomology to grain growing, the introduction and development of entomological field stations, and the practical value of the field stations to the farmers.

Notes on entomological inspection in the District of Columbia, E. R. SASSCER (*Jour. Econ. Ent., 7 (1914), No. 2, pp. 240–244*).—This is a brief description of inspection work carried on by the author.

[Report of the entomological department], L. HASEMAN (*Missouri Sta. Bul. 117 (1914), pp. 423–425*).—Brief notes on the work of the fiscal year ended June 30, 1913, with insect pests in Missouri are presented.

The relation of temperature to insect development, L. M. PEAIRS (*Jour. Econ. Ent., 7 (1914), No. 2, pp. 174–181, figs. 6*).—It is stated that the study carried on has seemed to prove the following points which are proposed as tentative laws:

"The rate or velocity of insect development is affected by temperature, and, other factors being constant, this rate increases in direct proportion to the increase in temperature within the normal limits of development. The curve expressing the increase in rate of development is a true hyperbole. The Developmental Zero, or what has been styled the 'critical point,' is at or near the point where the reciprocal curve for the time factor intersects the temperature axis. The thermal constant for an insect or any stage of an insect is the constant for the developmental curve for such insect or stage. The effective temperature for conditions of variable temperature, i. e., the ordinary daily variations, is higher than the mean for the period. (This point is not supported by any evidence in the present paper, but there is little doubt in the mind of the writer that it will be found to be correct.)"

The importance of the measure of evaporation in economic studies of insects, V. E. SHELFORD (*Jour. Econ. Ent.*, 7 (*1914*), *No. 2, pp. 229–233*).—The author reports upon a series of experiments conducted.

The use of atmometers to measure evaporation in the study of insects, V. E. SHELFORD (*Jour. Econ. Ent.*, 7 (*1914*), *No. 2, p. 249*).—A brief descriptive account.

Can insects become resistant to sprays? A. L. MELANDER (*Jour. Econ. Ent.*, 7 (*1914*), *No. 2, pp. 167–173*).—The author states that the data at hand do not permit the determination as to whether resistance and susceptibility are differences of degree and not of kind, or whether they behave as allelomorphs.

Insecticides, L. E. SAYRE (*Trans. Kans. Acad. Sci., 26 (1912), pp. 138–141, fig. 1*).—The author's experiments with cimicifuga, or bugbane, tend to show that this drug has been greatly overestimated as to its toxic properties toward insects.

Powdered cimicifuga seems to be devoid of insecticidal properties, crickets kept in contact with it for hours showing no ill effects. "As a fumigant cimicifuga proved unsatisfactory, acting more as an anesthetic than as an insecticide. One hundred times as much powdered cimicifuga as the amount of sulphur that proved effective was used, or the fumes from 2 gm. of the drug in a space of 9,000 cc. The insects were removed after a period of 1 hour, apparently dead, but recovered after an hour or 2 hours' time."

A commercial insecticide having the trade name "Vermingo," said to contain 6½ per cent carbolic acid among other ingredients, as a fumigant had one-fiftieth of the toxic power of sulphur, but by contact in an open jar it killed almost instantly.

Pyrethrum was tested as a fumigant but proved no superior to cimicifuga.

Some properties of various forms of arsenate of lead, J. A. DEW (*Jour. Econ. Ent.*, 7 (*1914*), *No. 2, pp. 162–167*).—Experiments conducted with the plum curculio in a peach orchard indicate that the killing power of arsenate of lead varies directly with the percentage of As_2O_5 that it contains.

Notes on the entomology of the Arizona wild cotton, W. D. PIERCE and A. W. MORRILL (*Proc. Ent. Soc. Wash., 16 (1914), No. 1, pp. 14–23*).—The insect enemies of *Thurberia thespesioides* observed by the authors include the boll weevil *Anthonomus grandis thurberiæ*, accounts of which have been previously noted (E. S. R., 30, p. 56); cotton leaf worm (*Alabama argillacea*); Thurberia bollworm; blister mites; a leaf gall due to a species of Itonididæ; a mealy bug (*Pseudococcus* sp.); etc.

Notes on the onion thrips and onion maggot, H. T. FERNALD and A. I. BOURNE (*Jour. Econ. Ent.*, 7 (*1914*), *No. 2, pp. 196–200*).—In the first part of this paper the authors present a brief account of the life history and habits of the onion thrips in Massachusetts, investigations of which have extended over a period of about 5 years.

The insecticides experimented with have not given satisfactory results, but it has been found that the destruction of all refuse after the crop is gathered and burning over all strips of grass through and around the fields will give very satisfactory results. Since the adult does not appear to fly far of its own volition unless carried by strong winds, it seems probable that onion fields can, at least to a considerable extent, be kept free from the thrips by running fire over all places near, in which they hibernate.

Most of the data here presented relating to the onion maggot have previously been noted from another source (E. S. R., 30, p. 160).

Two new insect pests of currants and gooseberries, R. A. COOLEY (*Jour. Econ. Ent., 7 (1914), No. 2, pp. 193–195*).—A small curculio, *Pseudanthonomus validus*, for which the name currant fruit weevil is proposed, has been found at the Montana Experiment Station destroying the fruit of the currant in a manner very similar to that of the currant fruit fly. *Liothrips montanus* is said to have caused a peculiar injury to the tender, terminal growth of gooseberries and red and black currants in Montana for several years past.

The destruction of mosquitoes, fleas, flies, pediculi, and other insect carriers of disease, J. S. PURDY (*Rpt. Austral. Assoc. Adv. Sci., 13 (1911), pp. 662–673*).—The author describes measures, such as drainage, use of petroleum and disinfectants, fumigation, etc., which he states have been successful in destroying insect disease carriers.

Grasshopper control in the southern division of Kansas, S. J. HUNTER and P. W. CLAASSEN (*Jour. Econ. Ent., 7 (1914), No. 1, pp. 73–83, pls. 3*).—A detailed report of work carried on in 1913.

On the proper generic names for certain Thysanoptera of economic importance, J. D. HOOD (*Proc. Ent. Soc. Wash., 16 (1914), No. 1, pp. 34–44*).—The author points out several changes that must be made in the generic names of Thysanoptera and presents a catalogue of the genera Frankliniella, Physothrips, Tæniothrips, Odontothrips, and Scirtothrips. It is pointed out that Euthrips is an absolute synonym of the genus Thrips and therefore can never be used as a generic name in zoology.

A bibliography of 34 titles is appended.

Sterility in oats caused by thrips, C. G. HEWITT (*Jour. Econ. Ent., 7 (1914), No. 2, pp. 211–218, pl. 1, fig. 1*).—*Anaphothrips striatus*, commonly known as the grass thrips, is a source of considerable injury to oats in Saskatchewan and British Columbia. The author presents a general review of the literature relating to thrip injury to cereal crops in connection with his discussion of the subject.

The periodical cicada in 1914, C. L. MARLATT (*U. S. Dept. Agr., Bur. Ent., Periodical Cicada in 1914, pp. 3, figs. 3*).—This paper gives information on the occurrence of Brood V of *Tibicen septendecim*, which occupies in the main a rather compact territory lying chiefly in Ohio and West Virginia with a few scattering colonies in Pennsylvania and Virginia. It is stated that some of the southern West Virginia records are open to doubt, as are also some of the records in Virginia. It is pointed out that the cicadas may be expected to emerge from the middle to the end of May and scattering individuals may be found up to the middle of June.

A request is made that information be furnished to supplement and complete the knowledge of the distribution of this brood.

Some Pemphiginæ attacking species of Populus in Colorado, C. P. GILLETTE (*Ann. Ent. Soc. Amer., 6 (1913), No. 4, pp. 485–493, pl. 1; 7 (1914), No. 1, pp. 61–69, pl. 1*).—The species discussed in this paper are *Thecabius populimonilis*, *Cornaphis populi* n. g. and n. sp., *T. populiconduplifolius*, *Asiphum sacculi* n. sp., and *Mordwilkoja vagabunda*.

A comparison of natural control of Toxoptera graminum in South Africa and the United States, W. Moore (*Ann. Ent. Soc. Amer., 7 (1914), No. 1, pp. 77–85*).—A report of comparative studies.

On a lycenid caterpillar reared in Acacia galls by ants of the genus Cremastogaster, F. Le Cerf (*Compt. Rend. Acad. Sci. [Paris], 158 (1914), No. 16, pp. 1127–1129*).—This is a report of observations made in East Africa.

The oviposition of two apple pests, G. W. Herrick (*Jour. Econ. Ent., 7 (1914), No. 2, pp. 189–192, figs. 3*).—This article relates to the green fruit worm and the Palmer worm.

Observations of the bee moth, F. B. Paddock (*Jour. Econ. Ent., 7 (1914), No. 2, pp. 183–188*).—This paper is based upon studies previously noted (E. S. R., 29, p. 859).

A new destructive cutworm of the genus Porosagrotis, occurring in western Canada, A. Gibson (*Jour. Econ. Ent., 7 (1914), No. 2, pp. 201–203*).—A cutworm identified as *Porosagrotis delorata*, probably synonymous with *P. orthogonia*, has been the source of serious loss to grain crops in southern Alberta since 1911. It is estimated that in the Lethbridge Land District in 1912 33 per cent of the grain sown was destroyed. In inspections of the infested districts it was found that beween 30,000 and 35,000 acres of grain were actually being destroyed by cutworms in the southern part of the Province of Alberta.

It appears to be the habit of this cutworm to travel over the surface of the soil and when a suitable plant for attack is found to burrow immediately and feed just below the surface. In experiments with poisoned bran 25 was the highest percentage killed, the underground feeding habit probably being the cause of the failure to get better results. It is stated that in large fields of sugar beets the attack in 1912 was stopped in 24 hours after the bran was applied.

Two Microlepidoptera on Thurberia thespesioides, A. Busck (*Proc. Ent. Soc. Wash., 16 (1914), No. 1, pp. 30, 31*).—*Dichomeris deflecta*, the larva of which is a leaf folder, and *Bucculatrix thurberiella* reared from *T. thespesioides*, both from Arizona, are described as new to science.

Feeding habits of Phlebotomus vexator, R. C. Shannon (*Proc. Ent. Soc. Wash., 15 (1913), No. 4, pp. 165–167*).—This hematophagous dipteran has been found to feed normally upon reptiles rather than upon warm-blooded animals.

Notes on a wood-boring syrphid, H. S. Barber (*Proc. Ent. Soc. Wash., 15 (1913), No. 4, pp. 151, 152*).—The syrphid *Temnostoma bombylans* has been found to bore in hickory logs in the early stages of decay.

Dispersal of Musca domestica, J. Zetek (*Ann. Ent. Soc. Amer., 7 (1914), No. 1, pp. 70–72, figs. 2*).—In experiments in the Canal Zone the house fly and *Hermetia illucens* were found to travel 2,500 ft. from a breeding place and become a menace within 32 hours.

A new tachinid parasite of Diabrotica vittata, W. R. Walton (*Proc. Ent. Soc. Wash., 16 (1914), No. 1, pp. 11–14, pl. 1*).—A tachinid parasite of the striped cucumber beetle reared at Hyattsville, Md., is described as *Neoceleatoria ferox* n. g. and n. sp.

The cabbage maggot in relation to the growing of early cabbage, W. J. Schoene (*New York State Sta. Bul. 382 (1914), pp. 231–247, pls. 6, figs. 5*).—A series of preliminary tests which demonstrated that carbolic acid emulsion and tar pads are the most effective of the various protective and remedial measures commonly recommended for the control of this pest led to the laboratory and field experiments here reported in detail.

The tests with carbolic acid emulsion at recommended strengths have demonstrated that it will prevent the hatching of the eggs and is fatal to the younger

stages of the larvæ. It may, however, cause injury to young seedlings and is not a safe remedy for plants recently set in the field.

"The value of tar pads, or hexagonal tar paper collars, for the purpose of preventing the adult of the cabbage maggot from placing eggs about the stems of the plants has been previously demonstrated, but, in spite of its effectiveness, this method of protecting cabbage has not been generally adopted by truck growers. The tests herein described show that tar pads will protect early cabbage from the pest at a cost of about $1.40 per thousand plants. Truck growers who are subject to losses by the cabbage maggot are urged to test the tar pads experimentally as a basis for more extensive operations against this pest." "In the employment of tar pads as a means of protecting early cabbage, truckers should arrange to transplant seedlings of good size with rather long stems. Disks can not be satisfactorily adjusted about small plants, for in setting such seedlings it is necessary to place them low in the soil so that only the leaves protrude."

Descriptions are given of the tar pads and the tool for making them.

A study of the bionomics of the common rat fleas and other species associated with human habitations, with special reference to the influence of temperature and humidity at various periods of the life history of the insect, A. Bacot (*Jour. Hyg.* [*Cambridge*] *Plague Sup. 3 (1914), pp. 447–654, pls. 8, figs. 15*).—*Ceratophyllus fasciatus, Pulex irritans, Ctenocephalus canis, Leptopsylla musculi,* and *Xenopsylla cheopis* were experimented with in the studies here reported. The author describes the apparatus and methods employed in making the observations, reports general observations on the bionomics of fleas, and gives accounts of an experimental study of the influence of external conditions and the influence of low temperature on the various stages.

On the survival of bacteria in the alimentary canal of fleas during metamorphosis from larva to adult, A. W. Bacot (*Jour. Hyg.* [*Cambridge*] *Plague Sup. 3 (1914), pp. 655–664*).—The results of the experiments here reported show (1) that the alimentary canal of the flea larva may become infected with the following bacteria if mixed with its food, namely, *Bacillus pyocyaneus, B. enteritidis, Staphylococcus albus,* and *S. aureus;* (2) that an infection of the larval gut may persist until the resting period of the larva in the cocoon, and (3) that there is no satisfactory evidence that such infection can survive the pupal stage. No infection of the larval gut was demonstrated in the experiment with *B. violaceus.*

The effect of the vapors of various insecticides upon fleas (Ceratophyllus fasciatus and Xenopsylla cheopis) at each stage in their life history and upon the bedbug (Cimex lectularius) in its larval stage, A. W. Bacot (*Jour. Hyg.* [*Cambridge*], *Plague Sup. 3 (1914), pp. 665–681, fig. 1*).—The results of investigations with the vapor of various insecticides are presented in tabular form.

A coleopterous (clerid) larva predaceous on codling moth larvæ, D. E. Merrill (*Jour. Econ. Ent., 7 (1914), No. 2, pp. 251, 252*).—The larva of an undetermined clerid beetle is quite an important enemy of the codling moth at Mesilla Park, N. Mex., where the observations were made.

Studies of the Arizona Thurberia weevil on cotton in Texas, B. R. Coad and W. D. Pierce (*Proc. Ent. Soc. Wash., 16 (1914), No. 1, pp. 23–27*).—The experiments here reported demonstrate the ability of the two varieties of the boll weevil to interbreed and produce fertile offspring. The work has also resulted in the determination of the developmental period for certain seasons of the year.

Reducing insect injury to stored corn, W. E. Hinds (*Jour. Econ. Ent., 7 (1914), No. 2, pp. 203–211*).—This paper deals with some preliminary facts

on the life history of *Calandra oryza*, futile remedial practices, and weevil resistance in corn varieties, and presents recommendations for future practice. A bulletin relating to the subject has previously been noted (E. S. R., 31, p. 58).

Information relative to bee keeping, C. E. SANBORN (*Oklahoma Sta. Circ. 28 (1914), pp. 2–8*).—A popular account prepared for use by the bee keeper.

Porto Rican bee keeping, E. F. PHILLIPS (*Porto Rico Sta. Bul. 15 (1914), pp. 24, pls. 2*).—This is a report of investigations made during May and June, 1913, of bee keeping in Porto Rico, where the industry has grown in the past 5 years from almost nothing to an export trade of $100,000.

Among the subjects discussed are the present extent of the industry, sources of honey, equipment and methods of manipulation, difficulties encountered, use of bees for pollination, diseases of bees, possibilities of wax production, etc.

The author concludes that the future of the bee keeping industry in the island is full of promise. The problems at hand are (1) the development of the industry as rapidly as is consistent with the experience of the bee keepers, and (2) the keeping out of the brood diseases.

A study of Dryophanta erinacei and its gall, C. J. TRIGGERSON (*Ann. Ent. Soc. Amer., 7 (1914), No. 1, pp. 1–34, pls. 11*).—This is a report of studies of the cynipid gall maker *D. erinacei*, including a discussion of its life history, parasites, guests, and the cause of gall formation.

A parasite of the chinch bug egg, J. W. MCCOLLOCH and H. YUASA (*Jour. Econ. Ent., 7 (1914), No. 2, pp. 219–227*).—This paper deals with the biology of the parasite previously noted (E. S. R., 29, p. 854), which has been described by Gahan in the article noted on page 355 as *Eumicrosoma benefica*.

In studies of the life history and habits of this parasite in Kansas it was found that for 81 individuals the average time between the collection of chinch bug eggs and the emergence of the parasites in May and June was 13.9 days. The average length of the life cycle for the second generation was 14.3 days; for the third generation 11.9 days; and for the fourth generation 9.9 days. From the last of July to the first of September for 249 parasites, reared from eggs collected in the field, the average time between collection and emergence was 9.8 days. The average length of the life cycle for the sixth generation was 15.2 days; for the seventh generation 17.6 days; and for the eighth generation 27.8 days. Thirteen was the largest number of eggs parasitized by a single female and 29 was the largest and 13 the smallest number of eggs found in 29 females dissected, with an average of 22.8. On an average from 70 to 75 per cent of the parasites obtained in the laboratory were females. It is stated that this parasite can breed parthenogenetically but the number of eggs parasitized per female is usually low and many of the offspring fail to develop. A number of experiments were conducted in which parasites were given eggs of false chinch bugs and other hemipterous eggs, but no parasitism occurred. A hasty survey made in August to determine the distribution in the State showed the parasite to be present in the 16 counties visited, in fact, it was found wherever material was collected, which covers practically all of the chinch bug infested region of the State.

"The average percentage of parasitism over the State of 16 per cent does not represent the actual number of chinch bug eggs destroyed. The period of oviposition of the chinch bug covers about 2 months, while the life cycle of the parasite covers a period of only 2 or 3 weeks. Thus the eggs of a single female chinch bug are exposed to about 3 broods of parasites, while the eggs of one brood of chinch bugs are exposed to 4 or 5 broods of parasites. Therefore, the percentage of parasitism for a brood of chinch bugs is at least 50 per cent. Experiments conducted in the field and in the laboratory show this to be true."

Hymenoptera of South America, J. BRÈTHES (*An. Mus. Nac. Hist. Nat. Buenos Aires, 24 (1913), pp. 35–165, figs. 18*).—Two hundred and seventeen species of Hymenoptera, largely from Argentina, are dealt with, many of which are characterized for the first time.

Among the important parasites dealt with are *Parepyris sylvanidis* n. sp. and *Cephalonomia meridionalis* n. sp., which attack the grain pest *Silvanus surinamensis; Tetrastichus ceroplastides* n. sp., parasitic on *Ceroplastes bergii; Platymesopus crausquinii* n. sp., a parasite of the screw worm; *Pteromalus caridei* n. sp., parasitic on *Papilio thoas thoantiades; Signiphora platensis* n. sp. and *Paracharitopus lecanii* n. sp., parasites of *Lecanium* sp.; *Allotropa meridionalis* n. sp., *S. argentina* n. sp., *Paranusia bifasciata* n. sp., and *Philoponcetroma pectinatum* n. sp., parasitic on *Dactylopius* sp.; *Trichogrammatoidea signiphoroides* n. sp., parasitic on Diaspis, Aspidiotus, etc.; *Eucerchysius scolytii* n. sp., parasitic on *Scolytus assimilis;* and *Brasemopsis halysidotæ* n. sp., a parasite of *Halisidota tessellaris.*

Report on parasites, L. O. HOWARD (*Ann. Ent. Soc. Amer., 7 (1914), No. 1, pp. 86–88*).—This is a brief report on the status of some of the more important introduced parasitic enemies of the gipsy and brown-tail moths.

Epimecis wiltii and its host, R. C. SHANNON (*Proc. Ent. Soc. Wash., 15 (1913), No. 4, p. 162*).—The ichneumonid *E. wiltii* has been found by the author to be an external parasite of spiders.

Biological notes on a few rare or little-known parasitic Hymenoptera, R. A. CUSHMAN (*Proc. Ent. Soc. Wash., 15 (1913), No. 4, pp. 153–161, figs. 2*).—A braconid parasite of lady beetles (*Perilitus americanus*) is reported to have been very abundant in the region of Vienna, Va., during the fall of 1912, being invariably so far as observed parasitic on *Megilla maculata. Paniscus geminatus* was found to be an external parasite of an undetermined lepidopterous larva. *Polysphincta terana* was taken as an external parasite from an adult female spider (*Steatoda borealis*). *Sphæropyx bicolor* was taken under codling moth bands on apple and pear trees as a parasite of *Apatela clarescens.* This parasite is said to be gregarious, as many as 30 having been reared from a single host.

Notes on the life history of Rhopalosoma poeyi, J. D. HOOD (*Proc. Ent. Soc. Wash., 15 (1913), No. 4, pp. 145–148, fig. 1*).—The author records *R. poeyi* as a parasite of the jumping tree cricket (*Orocharis saltator*).

New Hymenoptera from North America, A. B. GAHAN (*Proc. U. S. Nat. Mus., 46 (1914), pp. 431–443, pl. 1*).—The species here described of economic importance as parasites include *Elis atriventris* n. sp., reared from *Lachnosterna* sp., and *Bracon* (*Tropidobracon*) *meromyzæ* n. sp. and *Cœlinidea ferruginea* n. sp., at Elkpoint, S. Dak., and *Euphoriana uniformis* n. g. and n. sp., at Hagerstown, Md., all reared from *Meromyza americana; Pteromalus eurymi* n. sp. reared from *Eurymus eurytheme*, at Tempe, Ariz.; *Dibrachys meteori* n. sp. and *Eupelminus meteori* n. sp. reared from Meteorus infesting the fall army worm at Brownsville, Tex.; *Elasmus apanteli* n. sp. reared from *Apantcles harnedi* at Memphis, Tenn.; *Tetrastichus brucophagi* n. sp. reared from *Bruchophagus* sp., from alfalfa seed at Corcoran, Cal; *T.* (*Tetrastichodes*) *detrimentosus* n. sp. reared from *Coccinella sanguinea* and *Sympiesis agromyzæ* n. sp. reared from *Agromyza parvicornis*, at Lakeland, Fla.; *Gonatocerus eximius* n. sp. reared from jassid eggs at Orlando, Fla.; and *Eumicrosoma benefica* n. g. and n. sp. reared from eggs of the chinch bug, at Manhattan, Kans.

The parasites of the San José scale in New York, H. E. HODGKISS and P. J. PARROTT (*Jour. Econ. Ent., 7 (1914), No. 2, pp. 227–229*).—It is stated that

parasites of the San José scale were numerous in New York State during 1913. In order to determine the range of the species infested wood was collected from unsprayed trees in the more important fruit districts of the State, including 20 towns representing 13 counties. From the material 5 species were reared, namely, *Prospaltella perniciosi*, *Aphelinus fuscipennis*, *A. diaspidis*, *Signiphora nigrita*, and *Perissopterus pulchellus*, the last two species mentioned being comparatively unimportant. Taking the State as a whole breeding records for September and October, 1913, indicate that *Prospaltella perniciosi* was about the most numerous species during that period, though *A. diaspidis* was numerically greater in two counties, and *A. fuscipennis* ranked first in three counties.

In order to determine the ratio of parasitism numerical counts were made of scales after the rearings of the parasites were completed, some 20,000 individuals being examined of which about 3,500 contained exit holes of the hymenopterans. The percentage of affected scales was variable, and on the average ranged between 12 and 24 for the whole State. Some attention was also directed to the occurrence of parasites in orchards which had been regularly sprayed with lime-sulphur solution, it being found that in some instances 12 per cent of the scales were destroyed by the hymenopterans.

Ticks: The diseases which they transmit and means for their destruction, R. Van Saceghem (*Bul. Agr. Congo Belge, 5 (1914), No. 1, pp. 73–87*).—This is a summarized account.

An endoparasitic mite in the lung of Macacus rhesus, F. Landois and H. Hoepke (*Centbl. Bakt. [etc.], 1. Abt., Orig., 73 (1914), No. 6, pp. 384–395, pl. 1, figs. 3*).—The name *Pneumotuber macaci* is given to the mite here dealt with. A bibliography of 45 titles relating to the subject is appended.

FOODS—HUMAN NUTRITION.

Supplementing our meat supply with fish, Mary E. Pennington (*U. S. Dept. Agr. Yearbook 1913, pp. 191–206*).—The author points out the similarity of fish to meat in respect to its nutritive value, and summarizes statistical data regarding the fishery industries in this and other countries. Information is given regarding the kind and cost of fish in the American market, and brief statements made as to the preparation of fish for the table.

Concerning whitefish of Masurian Lakes of East Prussia, A. Gabriel and R. Limprich (*Ztschr. Untersuch. Nahr. u. Genussmtl., 27 (1914), No. 1–3, pp. 34–38*).—Methods of curing European whitefish (*Coregonus*, sp.) are described and analyses are reported.

Points which aid in determining whether or not flatfish have died in the water, Jugeat (*Hyg. Viande et Lait, 8 (1914), No. 2, pp. 57–63, figs. 2*).—The data recorded have to do with the detection and marketing of such fish.

Sea mussels—what they are and how to cook them (*U. S. Dept. Com., Bur. Fisheries Econ. Circ. 12 (1914), pp. 5, fig. 1*).—Some statements are made regarding the natural supply, flavor, and nutritive value of sea mussels, their cooking is discussed, and 18 recipes for their use are given.

The effect of cold upon the larvæ of Trichinella spiralis, B. H. Ransom (*Science, n. ser., 39 (1914), No. 996, pp. 181–183*).—A preliminary report is made of experiments carried out to determine the effect of cold storage upon the larvæ of Trichinella in pork.

It was found that most of the parasites survive when exposed to a temperature of from 11 to 15° F. for a period as long as 6 days, but when exposed to a temperature of about 0° they succumb quickly. In view of the difficulty of detecting these parasites in pork by microscopical examination, the possible use of refrigeration of pork as a means of preventing trichinosis is suggested.

Further experiments along this line are being carried out and it is expected that additional data will be available soon.

The examination of several kinds of sausage from Petrograd market, K. von Karaffa-Korbutt (*Ztschr. Untersuch. Nahr. u. Genussmtl., 27 (1914), No. 4, pp. 330–333*).—Analyses of sausage of different sorts and showing a considerable range in cost are reported and discussed.

Note on judging the quality of lard, K. Alpers (*Ztschr. Untersuch. Nahr. u. Genussmtl., 27 (1914), No. 1–3, pp. 142–152*).—A large number of analyses are reported and discussed.

Osmotic phenomena of yolk of egg, W. A. Osborne and Hilda E. Kincaid (*Biochem. Jour. 8 (1914), No. 1, pp. 28, 29*).—Data are reported regarding the behavior of unbroken egg yolk floated or immersed in ether, chloroform, carbon disulphid, alcohol, olive oil, and other liquids or solutions.

Supervision and marketing of eggs, A. Behre and K. Frerichs (*Ztschr. Untersuch. Nahr. u. Genussmtl., 27 (1914), No. 1–3, pp. 38–59*).—The weight and specific gravity of eggs kept from 43 to 99 days were determined and the data discussed with reference to defining market quality. Other characteristics of eggs were also studied.

Emmerich and Loew calcium bread and reasons for it, O. Loew (*Ztschr. Gesam. Getreidew., 6 (1914), No. 2, pp. 25–44*).—The author discusses the need for calcium in the diet, the possible lack of this element, the desirability of adding calcium if there is a deficiency, and the use in bread making of calcium chlorid and of a commercial preparation called "calcifarin" made from rye flour and calcium chlorid, in which, it is stated, the calcium salt is firmly united to the starch of the grain.

The author considers also the relation of calcium in the diet to arteriosclerosis and other pathological conditions, and here, as elsewhere, brings together many references to work and experience of others as well as his own data.

In a summary he states, among other things, that only those adults who use milk and vegetables in abundance secure a sufficiency of calcium and that those who eat an abundance of meat and secure their carbohydrates in the form of bread, potatoes, and beer have a special need for an increased calcium supply.

In a supplementary note the author refers to some matters pertaining to whole grain bread in comparison with bread made from fine flour. He is of the opinion that it is more rational to add calcium to fine flour than to attempt to change public opinion and substitute whole grain bread for it.

Migration of the constituents of maize grains into water and aqueous solutions, E. Poppe (*Bul. Soc. Chim. Belg., 27 (1913), No. 4, pp. 103–109*).—The results of investigations are reported on the removal of material when Indian corn is soaked in water or water containing acids, common salt, sugar, etc.

The equilibrium established between the moisture in the grain and the solutions depended solely on the concentration of the latter. When soaked for 48 hours at room temperature (20–33.5° C.), it was found that practically no material had been removed from the grain, owing to the fact that the epidermis cells were unbroken and consequently only semipermeable at the temperature employed. When the corn kernels were boiled in the water, 36.2 per cent of the nutritive material was removed, weak solutions of chlorids, nitrates, phosphates, and sulphates having practically the same effect as distilled water.

The data are discussed with reference to the economy of methods employed by the natives of the Belgian Kongo, in preparing corn for food, it being their custom to discard the water in which the corn is boiled, which involves a loss of nutritive material.

Foods from the grain sorghums.—Feterita products, C. K. Francis (*Oklahoma Sta. Circ. 27 (1914), pp. 8, figs. 3*).—This circular reports data regarding

the chemical composition and food value of feterita as compared with corn, Kafir corn, and wheat. Several recipes for the preparation of foods with feterita meal are given.

Meal used for crumbing foods, E. DINSLAGE (*Ztschr. Untersuch. Nahr. u. Genussmtl., 27 (1914), No. 1–3, pp. 173–176*).—Analyses are reported and discussed, with reference to quality, of commercial products used for crumbing foods in cookery.

Preserved tomatoes, P. CARLES (*Ann. Falsif., 6 (1913), No. 60, pp. 531–537*).—A number of different ways for the preservation of tomatoes are described, and definitions given of these products including canned tomatoes, puree of tomato, concentrated tomatoes, and extracted tomatoes, which are further dehydrated than the concentrated.

Analytical data are given and discussed, together with the more common methods of adulteration.

Grape juice as a nutritive and remedial agent, G. BENDER (*München. Med. Wchnschr., 61 (1914), No. 8, pp. 424, 425*).—Pasteurized grape juice and grape juice condensed in partial vacuum and called "grape honey" are discussed and special grape juice preparations are briefly described. A kilogram of "grape honey," the author states, contains the nutritive constituents of 6 kg. of grapes. He states that this condensed grape juice dissolves albumin, casein, and many other substances and may be used for such purposes in place of alcohol.

Investigation of tea, BESSON (*Mitt. Lebensm. Untersuch. u. Hyg., Schweiz. Gsndhtsamt., 4 (1913), No. 4, pp. 213–216*).—Data are given regarding the analysis of 30 samples of tea, part of a collection of 90 samples examined 2 years before.

Caffein and the other alkaloids found in tea, G. D. HOPE (*Indian Tea Assoc., Sci. Dept. Quart. Jour., No. 2 (1912), pp. 31–41*).—Data are given regarding the properties of alkaloids and their presence in various plants, and also in beverages such as tea, coffee, maté, kola, and cocoa.

In addition to caffein the closely related alkaloids of theobromin, theophyllin, xanthin, methyl xanthin, and adenin are found in tea. With the exception of caffein they exist in such small quantities as to be of little importance.

According to the author, the taste of caffein in tea is masked by that of tannin so that it is no factor in the judgment of the quality of tea as determined by tea tasters. In spite of this, however, caffein is undoubedly an important factor in the quality of tea as a beverage, the best tea containing relatively high percentages of caffein.

A larger percentage of caffein is found in the young leaves than in the older ones. As a rule, China and Japan teas contain less caffein than those of Java, India, and Ceylon. A table is given showing the per capita consumption of caffein in tea and coffee in the principal countries of the world.

Food and drug section, R. E. ROSE and A. M. HENRY (*Ann. Rpt. State Chem. Fla., 1913, pp. 93–146*).—Results are reported from the examination of a large number of food and drug products, beverages, water samples, and miscellaneous products.

Foods and drugs (*Bul. Ga. Dept. Agr., No. 61 (1913), pp. 167, pls. 2*).—This publication contains the report of the state chemist and other information regarding the state pure food and drugs act and its operation, including data regarding the examination of miscellaneous foods and beverages, the examination of milk, and the results of sanitary inspection work.

Enforcement of the food and drugs act for the years 1910 and 1911, R. M. ALLEN (*Kentucky Sta. Food and Drugs Rpt. 1910–11, pp. 35*).—General statements are made regarding food and drug inspection, which included the examination of 7,269 samples of food, of which 2,800 were found to be adulterated

or misbranded. The work done in inspection of bakeries, slaughter-houses, cold storage plants, grocery stores, etc., is also reported and discussed, with recommendations.

[Report of work under the Kentucky Food and Drugs Act], R. M. ALLEN (*Kentucky Sta. Food and Drugs Bien. Rpt., 7 (1911–1913), pp. 65, pls. 18*).—The work done by the department during the fiscal years July 1, 1911, to June 30, 1913, is reviewed. This included the analysis of 10,118 samples, of which 5,269 were found to be adulterated. The results are also given of the work accomplished in the experimental bakery for the instruction of bakers in improving existing conditions. Inspections were made of dairies, slaughter-houses, cold storage plants, grocery stores, food factories, bakeries, ice cream plants, restaurants, hotels, and pop factories.

Thirteenth annual report of the food and drug commissioner of South Dakota, G. G. FRARY (*Ann. Rpt. Food and Drug Comr. S. Dak., 13 (1913), pp. 136*).—The increased scope of the commission's work is discussed and the year's work described, including general inspection work under the pure food and drug law, the inspection of petroleum products and other work of the department, coal analysis, and the examination of a large number of samples of miscellaneous food products, drug products, and soap.

List of the analyses of samples of butter and other food products (*Penn. Dept. Agr., Mo. Bul. Dairy and Food Div., 11 (1913), No. 9–10, pp. 67–102*).—Data are reported as to the examination of butter and other food products.

Some attempts to standardize oven temperatures for cookery processes, MAY B. VAN ARSDALE (*Teachers Col. [N. Y.] Bul. 8, 5. ser. (1913), pp. 151*).—The inaccuracy of the usual household methods for determining oven temperature is discussed on the basis of a summary of data and attempts to control such methods by actual test.

The results of a number of experiments are reported on the relation of time and oven temperature to the cooking of a variety of foods. The observed range was from about 250 to 550° F. "It therefore follows that while 400° may be a relatively high temperature it can scarcely be called 'hot' for cooking purposes when so many of the ordinary processes require a much higher temperature."

A number of recipes are given with the temperature and time required for baking the quantities under consideration. A summary of the experimental data secured, the author points out, might yield such a classification of oven temperature as the following: Low temperature (250–350°), custards, meringues; low to moderate, sponge cake, angel food; moderate (350–400°), bread, gingerbread, plain cake, cookies; hot or "quick" (400–450°), Parker House rolls; hot to very hot, baking powder biscuit. Popovers begin at 450°, decrease to 390°, finish at 350°. Pastry (pies) begins at 500°, finishes at 450°.

The use of a thermometer in cookery by the housewife and in the instruction of children is discussed, the author's conclusion being that it will yield more definite and uniformly good results than the usually inaccurate descriptions which accompany recipes.

What the Department of Agriculture is doing for the housekeeper, C. F. LANGWORTHY (*U. S. Dept. Agr. Yearbook 1913, pp. 143–162*).—An account is given of the various activities of this Department which provide information valuable to the housewife, and particularly of the nutrition investigations of the Office of Experiment Stations. Some of the results of the nutrition investigations of interest to housekeepers are cited, the principal topics discussed being the results of experimental studies and their relation to planning meals, laboratory work and cooking problems, food and its care in the home, and the avoidance of waste of materials and time in providing food for the family.

Financing the wage-earner's family, S. NEARING (*New York, 1913, pp. 171, figs. 8*).—This book is an attempt to bring into comparison available figures upon the incomes of wage-earners in the United States and reliable estimates of the cost of maintaining a fair standard of living.

In the matter of the cost of living, the author estimates that between $450 and $650, according to locality, is necessary to maintain a minimum standard for an average family consisting of father, mother, and 3 children under 14. This provides only for the barest necessities—food, clothing, and shelter—and not for school books nor for the expenses attending illness or death.

The cost of a fair standard of living is estimated to be from $700 to $750 for a family of average size in the individual towns of eastern United States, and $100 more in cities—significant figures from the author's point of view, since he estimates that three-fourths of the males in the United States are earning less than that amount.

The author urges that local comparisons between wages and the cost of living be made, and for those who wish to undertake such studies his book with its ample bibliographical notes will serve as a guide.

How to live on 2d. a day, F. J. CROSS (*Cassell's Mag., n. ser., No. 23 (1914), pp. 223–228, figs. 3*).—A brief note, based on the author's experience, on the possibility of procuring a day's food for 4 cts.

How to live on 3d. or 4d. a day, F. J. CROSS (*Cassell's Mag., n. ser., No. 22 (1914), pp. 161–170, figs. 8*).—On the basis of his experimental study of the question, the author discusses the possibilities of economical living.

Dietetics in Italian tenements, WINIFRED S. GIBBS (*Pub. Health Nurse Quart., 6 (1914), No. 1, pp. 42–53*).—In connection with this article describing methods followed in teaching Italian housewives how to procure a better diet under American conditions, information is given regarding the kind of diet followed before and after instruction.

Domestic science.—[School lunch work in Gary, Indiana], CALLA KRENTEL (*Mo. Bul. Ind. Bd. Health, 17 (1914), No. 1, p. 7*).—A brief account, with menus, is given of school lunch work designed to be instructive as well as to provide suitable food. The preparation of the lunches is in the hands of the domestic science classes.

Sanitary conditions in Alaska.—[Food poisoning], E. KRULISH (*Pub. Health Rpts. [U. S.], 28 (1913), No. 12, pp. 544–551*).—Water supply, garbage disposal, and other questions are discussed.

The author states that cases of food poisoning are not uncommon among the natives, especially, it is said, in isolated districts where large quantities of canned food are consumed. He states that he has treated 7 cases of poisoning "due to the eating of putrid moose meat." "In some parts of the territory the natives eat fish heads which have been previously buried in the ground until they have undergone putrefaction; this dish they consider quite a delicacy."

The care of the baby (*Pub. Health Rpts. [U. S.], Sup. 10 (1914), pp. 14, fig. 1*).—This paper, prepared by a committee of the American Association for the Study and Prevention of Infant Mortality and presented to the association at its annual meeting held in Washington, D. C., November, 1913, discusses the feeding and care of infants. The publication is designed for popular instruction.

My dietary, S. S. SHERMAN (In *My Autobiography Continued from my 95th to 99th Year of my Age. Chicago, 1913, pp. 11, 12*).—The author, in his ninety-ninth year, describes his dietary. The usual breakfast consists of orange juice, a wheat cereal, an egg, and a cup of coffee; the midday meal, usually of a little soup with simple vegetables and a little meat, some simple dessert, and fruit, with a cup of boiled coffee or weak tea as the usual beverage. A glass of

milk an hour or two before retiring is the usual supper, though this is often omitted.

The principle on which the diet was selected is the use in moderate quantity of simple foods, which experience has shown to agree with the user, and of such a physical character that maceration in the mouth takes the place of mastication, which, in this particular case, is not possible.

Health through diet, K. G. and A. HAIG (*London, 1913, pp. X+227+31*).—The author believes the uric-acid-free diet is desirable and makes a plea for it.

Textbook on physiological chemistry.—I, The organic nutrients and their behavior in cell metabolism, E. ABDERHALDEN (*Lehrbuch der Physiologischen Chemie.—1. Teil, Die Organischen Nahrungsstoffe und ihr Verhalten im Zellstoffwechsel. Berlin and Vienna, 1914, vol. 1, 3. ed., pp. VIII+736, figs. 2*).—This volume, which presents the author's course of class-room lectures, has to do with carbohydrates, fats, protein, nucleo-proteids, and similar topics; the fate of such substances in the body; and other matters having to do with metabolism. The volume, which has been thoroughly revised, is a valuable contribution to the literature of physiological chemistry.

Observations on the processes of resorption in the cellular organism, M. RUBNER (*Arch. Anat. u. Physiol., Physiol. Abt., 1913, pp. 249–258; abs. in Chem. Zentbl., 1913, II, No. 26, p. 2149*).—The author's observations were made with yeast, the experiments having to do with the resorption of protein and sugar.

The resorption phenomena were found to be directly dependent upon the vital properties of living substance. In the case of nitrogen a decided selective function was noted with reference to nutritive material and resorption phenomena. In the case of the yeast cell resorption consists of two parts, namely, adsorption and penetration through the cell wall.

The investigations also report the results of comparative studies regarding the phenomena of resorption in a single cell organism and in a more complicated one.

Concerning resorption phenomena in the intestine, N. A. DOBROWOLSKAJA (*Biochem. Ztschr., 56 (1913), No. 4, pp. 267–290; abs. in Chem. Zentbl., 1914, I, No. 1, pp. 47, 48*).—Experiments are reported on the resorption of protein cleavage products. Contradictory results were obtained.

Contribution to the experimental study of the rôle of the spleen in digestion, C. L. RUSCA (*Gaz. Med. Ital., 63 (1912), Nos. 35, pp. 331–333; 36, pp. 341, 342; abs. in Zentbl. Biochem. u. Biophys., 16 (1914), No. 7–8, pp. 243, 244*).—The experiments, which were made with dogs, did not lead to definite conclusions.

The effect of a one-sided diet upon the composition of the body and upon the respiratory exchange in a subsequent fasting period, F. KLEINERT (*Ztschr. Biol., 61 (1913), No. 8, pp. 342–372, figs. 5*).—The experiments, which were made with dogs, led to the conclusion that the gaseous exchange and the respiratory quotient in fasting are influenced by the food taken during the period preceding the fasting period and by the composition of the body as affected by the food. In reaching such a conclusion, account must naturally be taken of other disturbing factors, such as muscular work and the upsetting of the general condition.

The effect upon the metabolism of man and animals of long-continued excessive diet of carbohydrate without protein, E. GRAFE (*Deut. Arch. Klin. Med. 113 (1913), No. 1–2, pp. 1–91; abs. in Zentbl. Biochem. u. Biophys., 16 (1914), No. 9–10, pp. 307, 308*).—In experiments with man (an insane person and a woman professional faster) and with animals it was found that an excess-

sive diet of carbohydrates without protein did not lead to a gain in weight but rather to a loss.

Absorption and fate of tin in the body, W. SALANT, J. B. RIEGER, and E. L. P. TREUTHARDT (*Jour. Biol. Chem., 17 (1914), No. 2, pp. 265–273*).—Soluble tin salts subcutaneously injected were found in the contents of the gastro-intestinal canal and in smaller quantities in the urine in tests with laboratory animals. The skin contained from 20 to 25 per cent, and the liver on an average about 5 per cent of the total amount injected.

"After feeding soluble salts of tin to rabbits for from 3 to 4 days, and to dogs for from 2 to 4 weeks, only traces could be detected in the urine. After feeding soluble tin salts to rats for 4 months appreciable quantities were found in the body. Soluble tin salts given intravenously disappeared from the circulation within 2 to 3 hours.

"The above data justify the conclusions that the gastro-intestinal tract is the chief organ for the elimination of tin; that the kidney plays a subordinate though an important rôle. Elimination of the metal is very slow; appreciable quantities are eliminated during the first and second days.

"Absorption of tin from the gastro-intestinal tract may take place under certain conditions."

Do foodstuffs contain substances at present unknown which are important for the maintenance of life? E. ABDERHALDEN and A. E. LAMPÉ (*Ztschr. Gesam. Expt. Med., 1 (1913), pp. 296–354; abs. in Chem. Zentbl., 1913, II, No. 6, pp. 522, 523; Jour. Chem. Soc. [London], 104 (1913), No. 614, I, p. 1409*).—A critical study in which the authors contend that the existence of vitamins and similar substances has not been definitely established.

On the influence of atmospheric pressure, temperature, and humidity on animal metabolism, W. THOMSON (*Mem. and Proc. Manchester Lit. and Phil. Soc., 57 (1912–13), pt. 3, No. 13, pp. 8, pls. 2*).—From the observation that the percentages of carbon dioxid in the air exhaled from the lungs of a number of people were on certain days nearly all low while on other days they were nearly all relatively high, the author was led to conduct a series of experiments in which the carbon dioxid in the air exhaled from the lungs was determined and at the same time observations made of the barometer, hygrometer, and thermometer.

It was shown by experiments that the percentage of carbon dioxid in the exhaled air was greater when the inhaled air had been previously dried with strong sulphuric acid, from which the author assumed that metabolism would be greater when breathing dry air than when breathing damp air. It was observed that the percentage of carbon dioxid in the exhaled air was greater at high elevations than in valleys and also greater in valleys than in a deep coal mine, from which the assumption is made that a low barometric pressure would produce increased metabolism, while high barometric pressure would result in decreased metabolism.

Greater metabolism, as indicated by production of carbon dioxid, was observed when the body was surrounded by cold air than when it was surrounded by warm or hot air, but if the body remained in cold air and warm or hot air was breathed metabolism was greatly increased. It was also noticed that the breathing of pure dry oxygen produced no greater metabolism than that of ordinary dry air. It was found that the metabolism was greatly increased for some time after violent exercise had been taken.

The data of these experiments with human beings and similar ones with laboratory animals are presented in tabular form, from which it appears "that, on all occasions where the barometer, hygrometer, or thermometer alters appreciably, there is a corresponding change in the percentage of carbon dioxid in

the exhaled air of all, or nearly all, the persons or animals tested." A rise in the barometer or marked increase in humidity produced a fall in the carbon dioxid, while a fall in the barometer or decrease in humidity produced a rise in the carbon dioxid exhaled. "The rise of the temperature of the air produced a lowering of the carbon dioxid in the exhaled air, and a fall in the temperature produced a rise.

"The rate of the pulse seems to have no influence on the percentage of carbon dioxid in the exhaled air. The temperature (sublingual) of the body appeared also to have little influence on the carbon dioxid in the expired air."

The influence of moisture in the air on metabolism in the body, W. THOMSON (*Mem. and Proc. Manchester Lit. and Phil. Soc., 57 (1912–13), pt. 3, No. 14, pp. 4*).—Further experimental data regarding the effect of moisture in the air are reported by the author in confirmation of the observations of the experiments noted above.

In these experiments, three different persons breathed first damp and then dry air at about 56° F. and afterwards both damp and dry air at 98°. An average increase of 4 per cent in the carbon dioxid in the exhaled air was observed when dry cold air was breathed over that observed when damp cold air was breathed. When warm dry air was breathed, an increase of about 7.5 per cent was observed over that noted when damp warm air was breathed.

Biochemical studies of expired air in relation to ventilation, C. WEISMAN (*Easton, Pa., 1913, pp. 99, fig. 1*).—An extended summary of data relating to the subject is given, and the results are reported of a series of experiments, from which the following conclusions are drawn:

Subcutaneous injection into guinea pigs of either isotonic condensation liquid from human breath, in amounts up to 20 cc. followed by intravenous injection of human blood serum in amounts up to 0.5 cc., or of isotonic condensation liquid from human breath, followed by intravenous injection of the same kind of material in amounts up to 3 cc., with a suitable incubation period between both injections, did not result in anaphylactic shock. Likewise intravenous injection of this liquid into human beings in amounts up to 8 cc. was not toxic. There was no evidence to show that the condensation liquid obtained from males is more toxic than that from females, or that proteins are volatile.

From the fact that the extremely sensitive anaphylactic test failed to show the presence of any sensitizing material in human breath, it is concluded that this material is not a factor to which may be attributed the ill effects of poor ventilation. The results of these experiments are contradictory to those obtained by Rosenau and Amoss, previously noted (E. S. R., 25, p. 866).

Metabolism during metal work, F. C. BECKER and O. OLSEN (*Skand. Arch. Physiol., 31 (1914), No. 1–3, pp. 81–197, figs. 13*).—The results of extended investigations are reported in which the carbon dioxid excretion was studied in periods of mental rest and activity, the mental work consisting in committing to memory meaningless syllables. Quotations from the authors' summary follow:

"The carbon dioxid percentage of the air expired is approximately constant during rest within each experiment and only the oscillations of the respiratory level furnish an approxi-expression for the oscillations in the carbonic acid eliminated. Moreover on transition to rest the carbon dioxid percentage of the alveolar air will rise, a fact which must probably be understood as an expression for an increased accumulation of carbon dioxid in the organism produced by a less effective ventilation of the lungs.

"In the case of minor muscular work, when the subject takes up the same position during the entire experiment and works with unhindered respiration, the value of the increase of metabolism may approximately be expressed by

the increase of the respiratory volume. While the efficiency, regarding the individually working muscle, reaches its maximum contemporary with the performing maximum work, the efficiency for the organism, as a whole, will reach its maximum long before the muscle reaching maximum of the output of work.

"Variations in the air pressure will influence the magnitude of the respiratory level so that relative maximum points in the level curve correspond to relative minimum points in the air pressure curve and vice versa; thus a rise or a sinking of the air pressure will involve a sinking or a rise of the respiratory level respectively.

"The respiration is reflectorily released with such an amount that the carbonic acid percentage of the alveolar air is kept about constant. Should any changes occur in the carbonic acid percentage of the alveolar air, the respiration will at once appear with a new value, endeavoring to equalize the changes. . . .

"When closing the eyes the respiratory level goes down, and a simultaneous decrease occurs in the carbonic acid eliminated and the oxygen absorbed; these changes being partly attributable to a less effective ventilation of the lungs. The respiration of a subject resting, but awake, has a wavy course, but on entrance of sleep the respiratory level is lowered, whereupon the respiration elapses with a constant level value. The cause of the wavy respiration of the subject, while awake and at rest, must partly be sought in changing states of consciousness.

"During the getting-by-heart of meaningless syllables, an increase of the organic elimination of carbonic acid occurred. This increase which is relatively big at the beginning of the work, is partly attributable to a dilution of the store of carbonic acid in the organism, but may besides, as a whole, be understood as an expression for a contemporary increase of the production of carbonic acid—consequently an increase of metabolism. A fraction of this increase arises from the muscular movements performed during the mental work, whereas the main part is due to psycho-physiological processes upon which the association work depends.

"The magnitude of the metabolic increase arising from mental work will oscillate parallel to the subjectively estimated amount of work performed. The metabolic increase attached to the performance of certain mental work will gradually decrease, according as the subject acquires greater practice in the work in question. Energetically the psychological notion 'concentration of attention' will furnish an expression for the peculiarity that one may voluntarily solve the same problem in the same space of time with a various amount of energy. The check occurring between contemporary energetical transformation in the brain takes in the main the same course as corresponding check effects in the case of simple physical motors."

ANIMAL PRODUCTION.

Further investigations into factors affecting the handling of wheaten hay, including a study of its digestibility, A. J. PERKINS, J. H. PHILLIPS, W. J. SPAFFORD, and N. S. MAY (*Jour. Dept. Agr. So. Aust., 17 (1914), No. 7, pp. 720–755, figs. 3*).—The results of 2 years' study at the Roseworthy Agricultural College of the character and digestibility of wheat hay, cut in various stages of development, indicate that maximum yields will be secured from cuts taken about 3 weeks after full bloom at a time when the grain is just about to leave the milky stage and enter upon the dough stage.

It was noted that hay cut after the milky stage tends to become ill-balanced hay, in which the culms and flag rapidly lose their feeding value, and if the

hay is not cut at least 2 weeks earlier than the ripening of the grain there occurs an actual loss of hay. There is a steady decrease in the percentage of mineral matter and a corresponding increase in that of organic matter with the ripening of the crop. The percentage of protein shows a rise during the first 3 weeks and a steady decline thereafter, that of fat remains practically stationary throughout the whole period, and that of carbohydrates steadily increases throughout the 6 weeks, with a corresponding decrease in the culms and flag, while that of fiber steadily rises in culms and flag and equally declines in the ears. A heavy loss of dry matter was noted in the last 2 or 3 weeks of the development of the wheat crop and it is believed that aside from the loss due to falling off of flag, the occasional shaking out of grain, and the leaching action of rain, there is some sort of migration of the mineral matter towards the root system as maturity advances.

The loss of weight on drying of a wheat crop is represented by approximately three-fourths of the green weight of the crop in the full-bloom stage, and by less than one-fourth of the green weight when the grain is ripe. Generally speaking, early-cut hay retains slightly more moisture than late-cut hay. It is believed that aside from the loss of moisture due to evaporation a crop of hay left to dry in the field undergoes a loss of moisture due to a chemical reaction set up in the drying cells of the plants, which involves a breaking down and loss of carbohydrates. This loss is estimated at 1½ per cent of the original green weight.

"Direct digestion experiments show that hay cut at full bloom is more highly digestible than any hay cut at later periods, and that in general the digestibility of wheaten hay decreases by regular steps as the period of complete ripeness is approached. In this connection there is a difference of over 12 per cent between the digestibility of hay cut at full bloom and that of hay cut a week before the ripening of the grain. This superior digestibility of wheaten hay cut at full bloom holds good all along the line, with the exception, perhaps, of the doubtful case of the mineral matter. The regular decline in the digestibility of hays cut at later periods is most marked in the case of proteins and fiber. Carbohydrates are, on the whole, rather erratic in their behavior, and perhaps on the whole they may be considered more or less stationary in their direct digestibility.

"The albuminoid ratio is narrower and more favorable in character in the earlier cut hays than in those in more advanced stages of development. This arises from the more highly digestible condition of the proteins in the less mature cuts of hay, and the overwhelming preponderance of carbohydrates in the later cuts."

Apples for live stock, A. TRUELLE (*Jour. Agr. Prat., n. ser., 26 (1913), No. 49, pp. 727, 728*).—Suggestions are given for the utilization of apples as a feed for live stock. Rations containing apples are formulated for different animals.

Acorns and beechnuts as feeding stuffs, O. ENGELS (*Landw. Vers. Stat., 82 (1913), No. 1–2, pp. 93–148*).—This article summarizes the results of analyses made by various investigators of acorns and beechnuts and of experiments conducted in feeding these products to farm animals. It is concluded that acorns are protein-poor but high in carbohydrate content; that they are highly digestible, although where fed in large quantities they hinder digestion and are constipating; and that small quantities may be successfully fed to sheep and goats, but are distasteful to dairy cows and horses. The shell comprises approximately 15 per cent of the entire nut.

Beechnut cake is successfully fed to cattle, sheep, hogs, horses, and poultry. In large quantities it is said to have a toxic effect. The shell comprises approximately 34 per cent of the entire nut and contains 2.11 per cent tannic acid.

The kernel contains a high percentage of phosphoric acid, given as 1.25 per cent.

Fish meal as a feeding stuff, H. H. MORGAN (*Daily Cons. and Trade Rpts. [U. S.], 17 (1914), No. 76, p. 7*).—It is stated that fish guano as a supplementary feed for cattle, hogs, and poultry is coming into more general use in Germany. Fish meal is mixed with hay, chopped straw, turnips, and other fodders. A fish-meal cake is manufactured from herrings which contains from 12 to 25 per cent of wheat bran or oat hulls and from 75 to 85 per cent of fresh chopped herrings.

Extensive importations of fish guano were being made to the United States.

[**New feeding stuffs**], H. H. MANN (*Ann. Rpt. Dept. Agr. Bombay, 1912–13, pp. 62, 63*).—Analyses are given of the seed of the roselle plant (*Hibiscus sabdariffa*) and of the tubers of the Indian plant kudu tondli (*Cephalandria indica*), both of which when properly prepared are said to be of value as feeding stuffs. Safflower cake is another feeding stuff said to be very rich in nitrogen.

[**Feeding stuffs**], R. E. ROSE and E. P. GREENE (*Fla. Quart. Bul. Dept. Agr., 24 (1914), No. 1, pp. 66–92*).—Analyses are reported of cotton-seed meal, bran, mowrah meal, corn, molasses feed, wheat middlings, shipstuff, hominy meal, linseed meal, and various mixed and proprietary feeds.

The feeding-stuffs inspection for 1911, 1912, N. J. BACHELDER (*Rpt. Bd. Agr. [N. H.], 32 (1911–12), pp. 229–267*).—Analyses are reported of cotton-seed meal, linseed meal, meat scrap, bone meal, cob meal, buckwheat middlings, dried brewers' grains, malt sprouts, dried beet pulp, gluten feed, hominy feed, wheat bran, middlings, molasses feed, alfalfa meal, and various mixed and proprietary feeds. The text of the state feeding-stuffs law is included.

Commercial feeds, edited by J. M. PICKEL (*Bul. N. C. Dept. Agr., 34 (1913), No. 11, pp. 39*).—Analyses are given of the following feeding stuffs: Wheat bran, middlings, shipstuff, corn, corn chop, cotton-seed meal, cotton-seed feed, rice meal, rich polish, crushed oats, buckwheat, dried beet pulp, gluten feed, screenings, molasses feed, and various mixed and proprietary feeds.

There is included a summary of the requirements of the state feed law.

Concentrated commercial feeding stuffs, compiled by J. W. SAMPLE and A. L. HARRISON (*Tenn. Agr., 3 (1914), No. 3, pp. 101–152, pl. 1, fig. 1*).—Analyses are reported of the following feeding stuffs: Bran, shorts, middlings, hominy feed, molasses feed, cotton-seed meal, and various mixed and proprietary feeds. There is included a digest of the Tennessee feed law, together with feed definitions.

Stock-watering places on western grazing lands, W. C. BARNES (*U. S. Dept. Agr., Farmers' Bul. 592 (1914), pp. 27, figs. 3*).—This publication gives suggestions for the development and improvement of stock-watering places. Items treated are natural watering places, including springs, seeps, and swamps, and artificial watering places, including reservoirs, wells, and water from mining tunnels. The types of troughs and their construction are discussed.

Animal husbandry department, F. B. MUMFORD (*Missouri Sta. Bul. 117 (1914), pp. 418–420*).—Five lots, each comprising 6 choice 2-year-old steers, were fed during a 130-day period a ration of alfalfa hay, corn silage, cold pressed cotton-seed cake, and corn in various forms. Lot 1 received broken ear corn, lot 2 shelled corn, lot 3 crushed corn and cob, lot 4 corn and cob meal, and lot 5 corn meal. Deducting the value of pork produced it was estimated that the final cost of grain in producing a pound of beef under these conditions was 7.14, 6.47, 7.31, 8.41, and 7.85 cts., respectively; and the profits realized were $6.18, $8.96, $6.21, $4.79, and $6.33, respectively, per steer.

In preliminary studies of the various planes of nutrition in their influence upon breeding cattle, it appears that heifers on a high plane of nutrition reach the breeding period at an earlier age but are more uncertain breeders than those maintained on a lower plane of nutrition.

In comparing the value of various roughages for breeding ewes it was found that "corn stover proved nearly as efficient as timothy hay. The use of silage instead of stover materially reduced the amount of grain required; silage, clover hay, and grain proved the most economical ration; clover hay and grain was the second in economy. Two lbs. of corn silage appeared to be equivalent to 1 lb. of hay in the ration where it was used. Breeding ewes proved to be very susceptible to poisoning from old silage."

In the feeding of animals it was found that warm feed and warm water show no advantage over cold feed and water, which results verify those of earlier trials. Notes on the improvements through the use of pure-bred rams have been reported from another source (E. S. R., 29, p. 870).

In an investigation of age as a factor in animal breeding it has been found by careful measurements that early pregnancy interferes with the rate of growth and the ultimate development of the maternal parent.

The South American meat industry, A. D. Melvin (*U. S. Dept. Agr. Yearbook 1913, pp. 347–364, pls. 8*).—The author reports on his recent tour of investigation made of the South American meat inspection and meat industry, especially Argentina, Paraguay, Uruguay, and Brazil. Data are presented showing the recent imports of food animals into the United States from Argentina, Canada, Mexico, Australia, Uruguay, and other countries.

Methods of freezing and salting of beef products in vogue in South America are discussed. Statistics are given on the supply of cattle and sheep in South America and a comparison made with other countries. It is believed that "while statistics show that Argentina is already slaughtering up to the limit of its present stock of cattle, that country has such great resources for cattle raising that it is easily possible for the stock raisers to bring about a large increase in the meat output if present prices are maintained, which, with the opening of the United States market, seems very probable."

The production of beef in the South, W. F. Ward (*U. S. Dept. Agr. Yearbook 1913, pp. 259–282, pls. 4*).—In this article the author discusses the possibilities of the South for beef production, the abandonment of the one-crop system, the growing of forage crops, grasses, and grains in the South, tick eradication, and the most approved methods of cattle production in the South as determined by experiment station results and reported in various station and Department publications previously noted.

The Bazadais cattle, G. Lafforgue (*Vie Agr. et Rurale, 3 (1914), No. 12, pp. 322, 323, fig. 1*).—The characteristics of this French breed of cattle are given.

The Garonnais breed of cattle, P. Herbet (*Vie Agr. et Rurale, 3 (1914), No. 12, pp. 324–330, figs. 6*).—This gives a historical sketch, characteristics, and measurements of this French breed of cattle.

The distribution of wild sheep, R. Kowarzik (*Mitt. Justus Perthes' Geogr. Anst., 60 (1914), No. 2, pp. 70–72, pl. 1*).—An account of the various breeds and types of wild sheep and of their geographical distribution.

Breeding caracul sheep, C. C. Young (*Jour. Heredity, 5 (1914), No. 4, pp. 170–178, pl. 1, figs. 3*).—The author reviews the history of importations and the development of the caracul sheep industry in the United States.

He found a difference to exist in the wooling characteristics of caracul rams and ewes, some having a coarse long wool, others a long coarse gray wool in which was hidden a fine lusterless short reddish wool resembling microscopically that of Merinos. It was found that this fine underwool came into the

strain through the admixture of some fine-wool-bearing Afghans, and it was fully determined that the fine wool in most of the sheep was entirely responsible for their inferior fur-producing qualities. The results of tests in interbreeding these 2 types indicated that "a very small amount of fine wool can be overcome, and considerable fine wool in ewes can be neutralized, where the ram is entirely free from the short fine underwool. Two crosses suffice to breed it out entirely."

Where Merinos and Shropshires were crossed with a pure-bred caracul ram "a very inferior skin was produced in which there was great lack of luster and a very important curl formation, giving the skin a matty appearance, valueless from a fur standpoint, but excellent results were obtained when the same ram was bred to such of our lustrous longwools as Lincolns, and such red Persian fatrumps as were entirely free from short wool and possessed very coarse wool." Where a pure-bred caracul ram was "bred to long-wool ewes, free from fine wool, and the skins of the lambs were obtained the first few days after birth, they showed tight curls uniform in size and possessing the required luster. Such half-blood skins were valued . . . at from $8 to $12 per skin. In all cases where the prices ranged from $3 to $4 the skins showed lack of luster and curl formation, which was easily traced to fine wool, either in the caracul rams or grade native longwools."

It is stated that in Central Asia there are "6 classes of caracul sheep, all of which owe their black pigment tendency to tight curl formation, and luster to the small black and nearly extinct Danadar sheeep. These breeds are known as (1) Large Arabi or Duzbai, (2) Small Arabi, (3) Intermediate Arabi, resulting from the crossing of the above-mentioned two classes, (4) Gray Shirad, (5) Zigais (of these classes there are very few), and (6) caracul Afghans, which last class unfortunately comprise 90 per cent of all the fur-producing sheep in Bokhara, and while possessing excellent mutton qualities and wonderful hardiness, like all of the other breeds, can hardly produce profitable fur in America, where people demand the best quality of the Persian furs."

The author comments on the difficulties of procuring breeding stock from Bokhara.

Alaska's reindeer industry, L. CHUBBUCK (*Jour. Heredity, 5 (1914), No. 4, pp. 149–154, figs. 3*).—The author comments on the Government's importations of reindeer to Alaska and the opportunities for the extension of the industry. It is suggested that it might be possible to cross the native caribou and the domesticated reindeer, thus preserving the size and vigor of the stock.

The preservation of the Arab horse, C. W. EDWARDS (*Philippine Agr. Rev. [English Ed.], 7 (1914), No. 1, pp. 47, 48*).—An effort is being made to preserve the pure-bred Arab horse. There is being formed in Cairo an international horse society, the object being the starting of a stud book, the arranging for annual shows and auction sales, and the encouragement of the breeding of Arabian horses. It is stated that at the present time the pure-bred Arab is found only among the different Bedouin tribes of the Arabian and Syrian deserts in Mesopotamia and in the Nedj, in a few private studs in Egypt, and in a very few of the European and American studs.

A study of sex-linked inheritance in poultry (*Missouri Sta. Bul. 117 (1914), pp. 430, 431*).—"In the spring of 1913 matings were made as follows: (1) Barred Plymouth Rock male and Black Minorca female; (2) Barred Plymouth Rock female and Black Minorca male; (3) White Leghorn male and White-crested Black Polish female; (4) White Leghorn female and Whitecrested Black Polish male; (5) Silver Spangled Hamburg male and Brown Leghorn female; (6) Silver Spangled Hamburg female and Brown Leghorn male; (7) Seabright Bantam male and Black Bantam female; and (8) Seabright

Bantam female and Black Bantam male. From all of the above matings, except (7), a large number of birds were obtained in the F_1 generation.

"Matings (1) and (2) gave typical sex-linked results: In (1), both the males and the females are barred, while in (2), the reciprocal cross, only the males are barred, the females being entirely black like their father. In matings (3) and (4), no sex-linked characters have been observed.

"The F_1 birds from matings (5) and (6) show a number of points of interest. The spangled pattern of the Hamburg is evidently sex-linked, but the pattern is not transmitted for the entire body as a unit. In all of the offspring of both crosses, the tail is pure black and shows no spangling whatever, but on the rest of the body the pattern is inherited as a sex-linked character. From mating (5), both cocks and hens are spangled, while from mating (6), the reciprocal cross, only the males are spangled, the females being black with some scattered brown and golden markings.

"The Bantam matings are of unusual importance by reason of the fact that the Seabright male lacks the usual secondary sexual feathers of poultry, and is therefore feathered like the female. The cocks of this breed have no sickle feathers, and the long hackle and saddle feathers are also absent. The crosses in question were made in order to determine the mode of inheritance of this peculiarity. It is known, furthermore, that the Seabright cocks show a greatly reduced fertility, and it is possible that a correlation exists between this condition and the absence of secondary sexual characters. From the mating (7), in which the Seabright cock was used, only 4 birds were obtained, 1 male and 3 females. The cock has the usual sickle feathers and the hackles and saddle. But in the mating (8), in which the reciprocal cross was made, all of the cocks are hen-feathered. A complete analysis of this result will not be possible until the next generation is obtained."

Studies on the feather formation of domestic fowl, K. ANDREAS (*Studien über die Locken- und Struppbildung beim Hausgeflügel. Inaug. Diss., Univ. Bern, 1913, pp. 45, pls. 3*).—A study of the feather formation and characteristics of some unusual types of domestic fowl, and of the effect of domestication and environment upon these characters.

Early development of scale and feather, J. SCHLEIDT (*Arch. Mikros. Anat., 83 (1913), No. 1–2, I, pp. 118–129, pls. 2; abs. in Jour. Roy. Micros. Soc. [London], No. 1 (1914), p. 33*).—The author finds that the scales on the chick's feet have primordia like those of reptilian scales. They consist of a proliferation of epidermis and dermis. It is stated that the "foot of the chick and the fore limb of the blackbird show embryonic down feathers on scales. At a very early stage the down primordia are seen as special differentiations on the scale primordia."

It is concluded that there is no homology between scales, embryonic down feathers, and definitive feathers.

Effect of Röntgen rays on organs of chicken, H. UNZEITIG (*Arch. Mikros. Anat., 82 (1913), No. 4, I, pp. 380–407, pl. 1, figs. 2; abs. in Jour. Roy. Micros. Soc. [London], No. 1 (1914), p. 38*).—It was found that "chickens can stand about 2 hours' exposure to a given intensity of Röntgen rays. For a few days following there is a marked reduction of body weight. Feathers often fall off. The bursa fabricii becomes smaller and lighter, and in one case almost disappeared. The lymphocytes of the cortical substance are destroyed in large numbers, the number of follicles is reduced; after the fifth day or so regenerative processes often set in. The testes are very susceptible; there is marked loss of weight and great destruction of sperm cells. The interstitial cells do not seem to be affected. The spleen loses greatly in weight and there is a marked reduction of lymphocytes."

Artificial insemination in birds, E. IVANOV (*Compt. Rend. Soc. Biol. [Paris]*, *75 (1913), No. 31, pp. 371–374; abs. in Jour. Roy. Micros. Soc. [London], No. 1 (1914), p. 34*).—The author has effected artificial insemination of hens and pheasants, and reports that a small percentage of the hens laid fertile eggs which developed.

Shipping eggs by parcel post, L. B. FLOHR (*U. S. Dept. Agr., Farmers' Bul. 594 (1914), pp. 20, figs. 6*).—In the experiments reported in this study in cooperation with the Post Office Department approximately 761 doz. eggs were sent through the mails in 466 shipments of from 1 to 10 doz. each. The total breakage was 327 eggs, of which 118 were only cracked or slightly broken and were usable. Of the 209 broken beyond use, 91 were broken because the parcels containing them were handled contrary to postal rules and regulations. Subtracting these, the loss was less than 1.3 per cent.

In the shipment of eggs it is advised that only fresh well-preserved eggs and preferably nonfertile eggs be sent. In trials made of a large number of styles and makes of containers quite a number proved satisfactory.

Complete details of methods of shipment and a suggested form of agreement between producer and consumer are given.

Eggs from China, G. E. ANDERSON, R. E. MANSFIELD, A. P. WILDER, and E. L. NEVILLE (*Daily Cons. and Trade Rpts. [U. S.], 17 (1914), No. 71, pp. 1142–1145*).—Notes on the Chinese exportation of fresh eggs and egg products, principally egg albumin, to the United States.

Table rabbit production, P. E. WILSON (*Newport (Salop), England, pp. 45, pl. 1, figs. 10*).—This booklet treats of the breeding, feed, care, management, killing, and dressing of rabbits for food production.

Economic value of North American skunks, D. E. LANTZ (*U. S. Dept. Agr., Farmers' Bul. 587 (1914), pp. 22, figs. 10*).—This publication discusses the value of skunks to agriculture as destroyers of rodents and injurious insects, their value as fur bearers, and the possibilities of raising them for their fur. Methods of feed, care, and management for commercial purposes are discussed. It is suggested that these animals should be protected everywhere by a close season of at least 9 months, but the right of farmers to destroy predatory skunks should be reserved.

DAIRY FARMING—DAIRYING.

Department of dairy husbandry, C. H. ECKLES (*Missouri Sta. Bul. 117 (1914), pp. 421–423*).—Portions of this report, relating to nutrients required for milk production and the characteristics of carotin have been reported from another source (E. S. R., 30, p. 773; 31, p. 273).

Results obtained in experiments made to determine the nutrients required to develop the fetus "confirm those previously reported that the amount of feed required to develop the fetus is so small that it cannot be measured by weighing the animal and taking the weights and analyses of the feed. In other words the fetus may be developed on a maintenance ration. A cow in producing about 200 lbs. of milk produces as much dry matter and of much the same composition, except in regard to the ash, which varies in certain respects, as would be required to develop the fetus."

In feeding cotton-seed products in combination with other grains results as to the composition of the milk and butter were obtained identical with those obtained in feeding cotton-seed meal containing equal quantities of oil. This indicates that the results from cotton-seed meal feeding are due to the oil content.

Results of studies made of the factors influencing the development of dairy heifers indicate that ordinary variations of feed have no measurable effect upon the development of the dairy functions. The tendency to produce milk is apparently an inherited characteristic not subject to much, if any, modification by feeding.

New method for determining the production value of feeding stuffs in the feeding of dairy cows, N. HANSSON (*K. Landtbr. Akad. Handl. och Tidskr., 52 (1913), No. 8, pp. 633–647; Meddel. Centralanst. Försöksv. Jordbruksområdet, No. 85 (1913), pp. 17; Fühling's Landw. Ztg., 63 (1914), No. 2, pp. 41–53; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 1, pp. 84–87*).—In feeding trials with dairy cows the Kellner starch value did not prove an exact measure of the feeds used for the production of milk. The difference between this starch value and the Swedish and Danish food-unit values is ascribed to the fact that Kellner's figures are the result of fattening experiments with steers, while the Swedish food-unit values are founded on experiments with milch cows; fats, carbonhydrates, and crude fiber have the same value in the 2 cases, but protein is more advantageously used in the production of the milk proteins than in the putting on of fat. It was found that by reckoning the digestible protein of fodder at 1.43 instead of 0.94 (Kellner's figure) the calculated values corresponded to those which resulted from the feeding experiments.

A method is proposed for calculating the milk-producing value which differs from Kellner's method for the calculation of the starch value only as regards the factor for the reduction of protein. A table is given showing the value of some of the principal feeding stuffs based upon this method. From this it is seen that one food-unit is generally equivalent to about 0.75 of the new values. By means of the new method a valuation may be made for feeding stuffs of the most varied composition provided their content of digestible matter is known.

The problem of the protein minimum in the dairy ration and of the market value of feeding stuffs, M. HOFFMANN (*Mitt. Dent. Landw. Gesell., 29 (1914), No. 11, pp. 162–165*).—Answers received to numerous inquiries made in the various Provinces of Germany indicated that but 20 per cent of the dairymen are using the Kellner standard, showing that that standard is not deemed entirely satisfactory. While the Kellner method is based on the assumption that 1 kg. of protein is equal to 0.94 kg. starch value, the equivalents in actual use range from $\frac{1}{2}$ to $\frac{2}{3}$ and $\frac{6}{7}$.

It is suggested that a uniform system of estimating market value of feeds is necessary.

Breeds of cattle of Switzerland, A. GERTSCH (*Rev. Vet. e Zootech., 4 (1914), No. 1, pp. 21–48, pls. 9*).—This is a discussion of the breed characteristics and milking capacity of the Swiss, Simmental, and Freiberg breeds of cattle of Switzerland.

The age for breeding dairy heifers, E. SIHN (*Kimball's Dairy Farmer, 12 (1914), No. 8, p. 233*).—This article reports the experiences of E. Tesdorpf of Denmark, covering observations for 10 years, in which 206 heifers calved at 2 years of age and 193 calved at 3 years. The average milk yield in the first lactation period was for the 2-year-olds 5,355 lbs. and for the 3-year-olds 5,676 lbs. However, in comparing the yields from the fourth to ninth years in which time the greatest development of the milk-yielding quality takes place, the 2-year-olds fully measured up to the 3-year-olds, and their vitality was equally as good if not better. With regard to abortion and failure to get in calf the 3-year-olds showed no advantage.

It is stated that these records are from one of the oldest and best herds of Red Danish cattle in Denmark, and that this may account in part for the strong showing of the 2-year-olds.

World's record for a dairy cow broken (*Hoard's Dairyman, 47 (1914), No. 13, p. 480, fig. 1*).—An account of a 7-year-old Guernsey cow, May Rilma, which has recently completed a 365-day test in which she gave 19,639.5 lbs. milk, containing 1,059.59 lbs. milk fat. This record is said to surpass that of any cow thus far.

Hereditary transmission of fat percentage, J. J. DUNNE (*Hoard's Dairyman, 47 (1914), No. 15, p. 553*).—Observations made for 12 years on a herd of red Danish cows tend to support the theory that Mendel's law dominates the variations of the fat percentages. It is believed that there are only two constant types in the herd, namely the cows with a tendency to give rich milk, i. e., 4 per cent, and those with a tendency to give poor milk, i. e., 3.3 per cent, while the animals with an intermediate fat percentage might be described as the crossbred product of the two foregoing types.

Cells in milk derived from the udder, R. S. BREED (*New York State Sta. Bul. 380 (1914), pp. 139–200, figs. 4*).—The purpose of this investigation was to determine the normal number of cells present in milk, to discover the reason for variation in the cell content of the milk of individual cows, and to study the influence of the milking machine on the number of cells present in the milk. The method used in counting the cells was the direct microscopical method in which the counting was done under an oil-immersion lens (E. S. R., 26, p. 274). The method of preparing dried milk smears here used gave excellent results and is deemed more accurate than where the cells are counted in centrifuge sediments.

It is pointed out that cells of two entirely different kinds are discharged in the milk of all cows throughout the entire lactation period. The larger number of the cells are leucocytes (white blood corpuscles) while a smaller number are epithelial cells, nuclei, or other fragments of such cells. It was found that the largest average number of the cells present in milk occur in colostral milk but equally large numbers are occasionally found in milk drawn at any portion of the lactation period. High counts are more common during the latter part of the lactation period than during the height of lactation, although the average total number of cells discharged per milking is less. There are marked daily variations in the number of cells discharged which do not show a close correlation with any of the suggested causes for such variations. No constant relation exists between the number of cells in fore milk and that obtained later, although there is an increase in the number of cells in the strippings which may possibly be due to manipulation of the udder or to other factors.

The four quarters of the udder do not act as a unit in the discharge of the cells but show as wide variations in number and character of the cells discharged as do separate udders.

Of 122 cows whose milk has been examined, 59 gave cell counts under 500,000 per cubic centimeter, 36 gave counts between 500,000 and 1,000,000, and 27 gave counts over 1,000,000 per cubic centimeter. The average cell count was 868,000 per cubic centimeter. The milk of all these cows was apparently normal. In an examination of goat's milk the numbers of cells found were uniformly high, the average count for 11 goats being 7,465,000 per cubic centimeter.

Changes of a considerable amount in the vacuum used to operate milking machines were found to be entirely without effect on the cell content of the milk. The station herd which has been accustomed to machine milking showed a much lower average cell content than the milk of other herds, indicating that the number of cells present in machine drawn milk is somewhat less than that

of hand-drawn milk. The results obtained in the course of the experiments do not indicate that high vacuums or changes in vacuum may of themselves cause the excessive discharge of cells or draw blood from the interior of the udder.

The reasons for the discharge of the two kinds of cellular elements are different. The epithelial cells are presumably discharged because they are worn out in the process of the secretion of the milk. The reason for the presence of the leucocytes is not so clear. By some investigators it is believed that they are attracted into the milk by the presence of bacteria in the udder, especially by the pus-forming streptococci. The investigations here carried out have not demonstrated what relationship exists, if any does exist, between the number of cells discharged and specific infections of the udder. Enough data were secured, however, to make it probable that there are other reasons for the discharge of leucocytes in the milk than the presence of bacteria in the udder. These other reasons undoubtedly have to do with the physiological conditions surrounding the process of milk secretion.

Bacterial and enzymic changes in milk and cream at 0° C., MARY E. PENNINGTON, J. S. HEPBURN, E. Q. ST. JOHN, ET AL. (*Jour. Biol. Chem., 16 (1913), No. 3, pp. 331–368*).—In some previous work (E. S. R., 20, p. 179) it was demonstrated that raw milk held at or a little below a temperature of 0° C. undergoes marked proteolysis, which is very noticeable at the end of 2 weeks. The function of the present research was to determine which part of the proteolysis is due to bacteria and which part is due to the enzyms of milk, and, finally, what results when both bacteria and enzyms act together.

It is shown that the proteolysis of casein is due primarily to bacterial action, while that of lactalbumin is due to the enzyms of the milk. Bacterial and milk enzyms, when active at the same time, cause a greater degree of proteolysis. In the course of proteolysis the true proteins are broken down to caseoses, peptones, and then to amino acids. The fermentation of lactose is largely, if not entirely, due to bacterial action.

"The digestion of the protein, the fermentation of the lactose, and the increase in acidity are progressive changes, and are accompanied by more or less progressive lowerings of the freezing point of the milk. The depression of the freezing point of the cream is to be ascribed to chemical changes in its protein and lactose. . . . "During the holding at 0°, the organisms of the raw untreated and reinfected sterile milk and cream undergo an increase, which is most striking in the raw untreated milk."

[Dairy laws], compiled by L. J. SMITH and F. B. DUVALL (*Sess. Laws Colo., 1913, pp. 231–245*).—This is the text of the Colorado laws relating to the regulation of the production, sale, and shipment of dairy products and oleomargarine, the inspection of dairies, creameries, etc., standards for dairy products, rules for sampling, and other related subjects.

Is the establishment of a uniform fat standard for whole milk practical? O. MEZGER (*Milchw. Zentbl., 42 (1913), Nos. 16, pp. 492–499; 17, pp. 522–528; 18, pp. 545–555; 19, pp. 574–580, figs. 4; 20, pp. 609–616, figs. 2*).—In commenting on the impracticability of a uniform fat standard for whole milk the author cites a number of earlier investigations showing that milk undergoes wide daily and weekly changes due to feeds, lactation period, and other variable factors.

Principal types of micro-organisms in Baltimore milk, L. P. SHIPPEN (*Bul. Johns Hopkins Hosp., 25 (1914), No. 278, pp. 122–128*).—It was found that the most frequently encountered organism in the milk examined was *Bacillus lacticus*, or as the author chooses to term it, *Bacterium güntheri*. Certain strains of the bacterium resemble *Streptococcus pyogenes*, but may be dif-

ferentiated from it. Pasteurization at from 60 to 70° C. destroys certain strains of *B. güntheri*.

B. œrogenes and *B. coli* were frequently found in the milk examined. Other types of micro-organisms were found in lesser and inconstant numbers.

A bibliography of 23 references is included.

Blue milk, A. WOLFF (*Milchw. Zentbl., 42 (1913), No. 19, pp. 571–574*).—The occurrence of blue milk is ascribed to *Bacterium syncyaneum* and *B. cyaneofluorescens*. The former bacterium forms small blue spots on the surface of milk which rapidly increase in size and may extend downward. It is dependent upon the presence of the lactic acid bacterium, without which the formation of pigment can not continue in strongly acid milk. There are also other organisms capable of coloring milk blue. It is thought that though these microorganisms of blue milk are easily killed by pasteurization, the ordinary temperature of from 68 to 70° C. is too low unless kept up for 30 minutes. Flies and water are common carriers of these organisms and are the sources of infection of milk.

The composition of carabao's milk, E. R. DOVEY (*Philippine Jour. Sci., Sect. A, 8 (1913), No. 3, pp. 151–157*).—The average composition of 19 samples of carabao's milk is given as follows: Specific gravity at 17.5° C. 1.0364, water 78.46 per cent, total solids 21.55, fat 10.35, solids-not-fat 11.2; protein 5.88, casein 5.35, albumin 0.53, lactose 4.32, and total ash 0.844 per cent. The fat butyro-refractometer reading at 25° was 49.7, the specific gravity of the serum at 20° 1.0345, and the immersion refractometer reading at 20° 45.3.

It was found that whereas in cow's milk the fat is approximately 30 per cent of the total solids, in the case of carabao's milk it reaches nearly 50 per cent. The ratio of lactose, protein, and ash in carabao's milk is given as 5 : 7 : 1. The ratio of casein to albumin in carabao's milk is given as 1 : 10, and for cow's milk 1 : 55. However, the amount present fluctuates considerably. The ratio of mineral matter to solids-not-fat is approximately the same in carabao's milk as in cow's milk but the ratio of phosphoric acid and calcium to ash is greater in the former than in the latter. It is shown that carabao's milk varies greatly in composition, and it is recommended that a minimum of 8.5 per cent of solids-not-fat and 8 per cent of milk fat be adopted as the standard.

The average composition of cheese made from carabao's milk is given as follows: Water 52.52 per cent, fat 28.47, protein 15.47, acetic acid 0.071, lactic acid 0.337, insoluble ash 1.63, soluble ash 3.91, and sodium chlorid 0.438 per cent, with a fat butyro-refractometer reading at 25° of 50.3.

Composition of goat's milk, A. STORCH (*Ztschr. Fleisch u. Milchhyg., 24 (1914), Nos. 12, pp. 269–272; 13, pp. 298–309; abs. in Molk. Ztg. Berlin, 24 (1914), No. 14, pp. 159, 160*).—On an average goat's milk was found to have a specific gravity of 1.0291, a fat content of 2.87, and a fat-free dry substance content of 8.109 per cent. It was found that the fat and fat-free dry substance in goat's milk varies widely with different individuals. In general goat's milk is lower in fat content than cow's milk. Age and milk yield, green feeding, and pasturing exert no appreciable influence on the composition of the milk, but evening milk is richer in fat and fat-free dry substance than morning milk. No uniform change occurs in the composition with advancing lactations, and the content of fat-free dry substance remains practically constant to the end of the lactation period, although during the first 10 days after kidding the content of fat and fat-free dry substance in the majority of cases increases.

The composition of the milk of the Saane, native, and crossbred goat is similar. The colostrum character of goat's milk is lost very soon after kidding, usually within 12 hours. The end milk is richer than that first drawn.

Composition of ewes' milk butter, M. MARTIN (*Ann. Falsif., 6 (1913), No. 62, pp. 662, 663; abs. in Internat. Inst. Agr. [Rome] Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 3, pp. 403, 404*).—Ewes' milk butter is characterized as being very white, soft, and difficult to work and to dry. It is rarely used on the table but is found mixed in various proportions with cows' milk butter. Its chemical composition is said to be very nearly that of cows' milk butter, but the content of insoluble volatile acids and saponification value are much higher.

Summary of the results of researches made during the last few years at the Dairy Institute at Alnarp (Sweden), L. F. ROSENGREN (*Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 1, pp. 121–125*).—It was demonstrated that if whey is submitted to a violent motion, such as, for instance, working in a churn for 30 minutes at a temperature of 50° C. (122° F.), the cream could not afterwards be separated to the same degree as if it had not been so treated. Whey containing 0.305 per cent of fat was reduced by separating without previous churning to a fat content of 0.035 per cent, while when churned before separating it was reduced to only 0.235 per cent. It was found that the degree to which milk is capable of separation at the different periods of lactation is variable, being greater in the case of cows recently fresh than in those drying off.

Brief notes are given on the value of ripening cream at low temperatures, keeping of lactic ferment, influence of too acid a ferment on the butter, factors determining the water content of butter, influence of various kinds of concentrated feeds on butter, control of iron salts in wash water for butter, use of cultures of lactic ferments in cheese making, and the coating of cheese with paraffin.

Cheshire cheese, Miss G. N. DAVIES (*Jour. Agr. [New Zeal.], 7 (1913), No. 3, pp. 287–293*).—Directions are given for the making of Cheshire cheese, which is described as having a texture loose, open, and flaky, strikingly unlike the Cheddar's smooth solidity.

Condensed milk and milk powder, O. F. HUNZIKER (*Lafayette, Ind., 1914, pp. V+7–239, figs. 62*).—This book treats of the various phases of the condensed and powdered milk industry, including the processes of condensing and desiccating milk, skim milk, buttermilk, and whey.

Organisms in condensed milk (*Jour. Amer. Med. Assoc., 62 (1914), No. 16, pp. 1257, 1258*).—Commenting on the bacteriology of condensed milk, it is shown that this product, contrary to general opinion, is rarely sterile. However, the presence of bacteria or of body cells is no greater than in market milk, even of the certified grade, and in fact, there appears to be a comparative paucity of cells in the cheap machine-skimmed condensed milks, due to the removal of débris and dirt through the centrifugal separators. It is stated that condensed milk may contain the types of bacteria commonly found in fresh milk, *Bacillus coli*, streptococci, a few staphylococci, and *B. enteritidis sporogenes*, together with ordinary air contaminations, such as *B. substilis* and *B. Mesentericus*.

While there is a tendency to depreciate the importance of these bacteria in condensed milk it is believed that efficient pasteurization before the condensing process would prevent the presence of such organisms in the final product.

Aluminum milk cans, WINKLER (*Österr. Molk Ztg., 21 (1914), No. 3, p. 39, fig. 1; abs. in Cream. and Milk Plant Mo., 2 (1914), No. 8, p. 25*).—An account of the use of aluminum milk cans. This metal is not attacked by sour milk and the cans are not affect by repeated steaming. The cans are made of corrugated sheet iron or steel, covered inside with aluminum bronze and closed tightly at the junction, and are recommended particularly for certified milk. They should not be cleaned with soda.

International Federation of Dairying (*Bul. Féd. Internat. Lait., No. 7 (1913), pp. 144, pls. 3, figs. 5*).—This bulletin summarizes the proceedings of the International Federation of Dairying, held in Brussels in April, 1913, gives statistics relating to the dairy industry in Hungary, and outlines methods of cheese control in Holland.

VETERINARY MEDICINE.

Manual of the practice of veterinary medicine, E. COURTENAY, revised by F. T. G. HOBDAY (*London, 1913, 3. ed., pp. 450, figs. 77; rev. in Amer. Vet. Rev., 44 (1914), No. 6, pp. 767, 768*).—The third revised edition of this work (E. S. R., 14, p. 910).

Veterinary state board questions and answers, V. G. KIMBALL (*Philadelphia and London, 1914, pp. VII+395*).—This work, which is intended for the use of those about to take a state board examination, is arranged under the headings of the several subjects covered in such examinations, namely, chemistry, anatomy, physiology, pathology, theory and practice of medicine, surgery, obstetrics, materia medica and therapeutics, sanitary science—meat and milk hygiene, and zootechnics. Through the complete index furnished the work also forms a general reference book on veterinary science.

Ophthalmology for veterinarians, W. N. SHARP (*Rev. in Cornell Vet., 4 (1914), No. 2, pp. 106, 107*).—This is a review by D. H. Udall of the work previously noted (E. S. R., 29, p. 377).

Exercises in bacteriology and diagnosis, V. A. MOORE and C. P. FITCH (*Boston, Chicago, and London, 1914, pp. XIX+154, figs. 10*).—This small book, which is intended for veterinary students and practitioners, is in its fourth edition. It is intended to be used as a laboratory guide and also contains a small appendix dealing with biologic diagnostic methods.

Apparent inconsistencies of biologic diagnostics, R. A. ARCHIBALD (*Amer. Vet. Rev., 44 (1913), No. 1, pp. 58–65; Proc. Amer. Vet. Med. Assoc., 50 (1913), pp. 675–683*).—The purpose of this paper is to demonstrate that biologic diagnostic methods, if properly applied, are absolutely consistent, and that this depends upon the stage of the disease through which the animal is passing at the time at which the tests are applied.

Menziesia, a new stock-poisoning plant of the Northwestern States, C. D. MARSH (*U. S. Dept. Agr., Bur. Plant Indus., Menziesia, A New Stock-Poisoning Plant (1914), pp. 3, pls. 2*).—A rather heavy loss of sheep in the Pend Oreille National Forest in Idaho was brought to attention in the summer of 1912. Preliminary feeding experiments with *Menziesia glabella* showed that it is poisonous to sheep and indicated that the deaths were due to this plant. The Rocky Mountain species grows on moist northern slopes in open woods and about the "balds" at altitudes of 3,500 to 6,000 ft. It is a local species, occurring abundantly in many places, but often many miles may be traveled at the right altitude without coming upon it.

The symptoms exhibited in cases of poisoning by Menziesia are much like those seen in poisoning by other plants. Salivation or frothing at the mouth is noticeable, and this is followed by weakness leading to a staggering gait and culminating in a more or less complete paralysis. There is generally pronounced nausea and sometimes difficulty in breathing. It is stated that the plant is not extremely toxic, the experiments showing that a considerable quantity must be eaten before symptoms of intoxication appear. When, however, sheep eat any great quantity of Menziesia serious losses may occur. It is deemed important that herders handling sheep in the mountains of Idaho,

Washington, and Oregon become acquainted with the plant and take proper precautions to prevent the sheep from eating any large quantity of it.

Mold fungi in oil cake, E. SCHNEIDER (*Milchw. Zentbl., 42 (1913), No. 10, p. 313*).—The author finds that draft oxen and young cows which have calved for the first time are not affected by moldy oil cake.

The immunological relationship of hordein of barley and gliadin of wheat as shown by the complement fixation, passive anaphylaxis, and precipitin reactions.—The biological reactions of the vegetable proteins, IV, G. C. LAKE, T. B. OSBORNE and H. G. WELLS (*Jour. Infect. Diseases, 14 (1914), No. 2, pp. 364–376*).—Among the principal conclusions drawn from these experiments, which continue earlier work (E. S. R., 30, p. 778), were the following:

"Carefully purified preparations of vegetable proteins readily produce antisera. The antisera obtained in our experiments differed in their range of reactions, some giving only the complement fixation, some the complement fixation and precipitin tests, while others in addition conferred passive anaphylaxis to guinea pigs.

"Antisera to the same protein obtained from different individual animals differ in their reactions, for some unknown cause. . . . A specific complement fixation reaction in high dilution does not necessarily accompany reactions with the heterologous proteins, nor can such serum always produce the passive anaphylaxis reaction. Both the precipitin and passive anaphylaxis reactions appear later in immunization than the complement fixation reaction, and seem to be closely related to each other in delicacy."

The anaphylactogenic activity of some vegetable proteins.—The biological reactions of the vegetable proteins, V, H. G. WELLS and T. B. OSBORNE (*Jour. Infect. Diseases, 14 (1914), No. 2, pp. 377–384*).—According to the authors' conclusions the data presented support the assumption "that the severity of the anaphylaxis reactions produced by intraperitoneal injections of dilute, alkalin solutions of vegetable proteins is, approximately, in inverse ratio to their relative precipitability when their solutions are mixed with the peritoneal fluid.

"Proteins like edestin, which are readily precipitated and only slowly redissolved under conditions similar to those presumably prevailing in the peritoneum, rarely produce a fatal intoxication; whereas those that are less easily precipitated and more readily dissolved give fatal reactions in much smaller doses."

Other conclusions have to do with lethal and minimum intoxicating doses.

About the specificity and other properties of the ectoproteases, C. FERMI (*Centbl. Bakt. [etc.], 1. Abt., Orig., 68 (1913), No. 5–6, pp. 433–454; 69 (1913), No. 7, pp. 465–474; Arch. Farmacol. Sper. e Sci. Aff., 15 (1913), Nos. 1, pp. 36–48; 2, pp. 49–65; 3, pp. 131–144; 4, pp. 145–162; 5, pp. 233–240; 6, pp. 241–250*).—This deals with the distribution of proteolytic enzyms in the animal and vegetable kingdoms. For this purpose organs of animals belonging to the Mammalia, Aves, Reptilia, Amphibia, Pisces, Mollusca, Insecta, Arachnida, Myriapoda, Crustacea, Echinodermata, Vermes, Spongilla, Cœlenterata, and Protozoa were used. The proteolytic enzyms in the plant kingdom were from pathogenic and nonpathogenic bacteria, molds, and imperfect fungi, and the studies were made with autolyzed press juices from animal organs.

In this connection, the time at which the proteolytic enzyms selected for different substrata appear during the development of the animal or plant in question is considered. In addition the results of experiments made on the activation of certain proenzyms, exposing the enzyms (vegetable and animal) to light and heat, filtration through porcelain filters, and dialyzing tests, are recorded.

A preliminary report on the value of leucocytic extract from a therapeutic standpoint, R. A. ARCHIBALD (*Proc. Amer. Vet. Med. Assoc., 50 (1913), pp. 451–460*).—For preparing the leucocytic extract the blood taken from the jugular

vein of a horse or other domestic animal is drawn into a flask containing a sufficient quantity of 1 per cent sodium citrate solution to prevent coagulation. It is then centrifuged, the sodium citrate solution and serum drawn off, and the corpuscles treated with 0.5 per cent acetic acid solution. It is then centrifuged again and the process repeated several times with acetic acid until the mass of corpuscles is free from red blood corpuscles.

"The leucocytes are then washed with physiologic salt solution 3 or 4 times to remove most if not all trace of the acetic acid, after which they are ground in a mortar with quartz sand. To the washed and ground leucocytes is added about 5 volumes of sterile distilled water to 1 volume of leucocytes. This mixture is exposed to a temperature of 58° C. for 1 hour, when it is placed in the incubator for a period of 12 hours, and again exposed to a temperature of 58° for one hour. This process of exposure to different temperatures is continued for 2 or 3 days or until autodigestion is complete. It is then centrifuged, the supernatant fluid decanted, and sufficient tricresol added for preservative purposes." The extract so prepared, when given parenterally, gives rise to a marked leucocytosis.

"While the total leucocyte counts were intensely interesting, the differential counts were infinitely more so. The polymorphonuclear neutrophils increased about 100 per cent, the small mononuclears decreased about 100 per cent, the large mononuclears decreased about 25 per cent, while the eosinophils increased about 800 per cent. In all our experiments we found that there occurred a marked eosinophilia. In fact, in one rabbit the eosinophils showed by differential count 44⅔ per cent of the total count."

"The practical therapeutic application of leucocytic extracts has been followed out during the past year, not only in our own practice, but also by other practitioners. Various infections have been treated with, in some types of infections, encouraging results, while in others the beneficial results were not so marked.

"The diseases to which the treatment has been applied, and which have given the most gratifying results are such infections as purpura, influenza, pneumonia, distemper in dogs, etc."

Autogenous vaccines, W. W. LANG (*Vet. Rec., 26 (1914), No. 1331, pp. 434, 435*).—In this brief article the author relates his experiences with the use of autogenous vaccines, especially for cases of strangles and poll evil. Their use is recommended.

Experiences with the Abderhalden dialysis method.—I, Cleavage of thymus tissue by a normal serum, HELENE DEUTSCH (*Wiener Klin. Wchnschr., 26 (1913), No. 38, pp. 1492–1494; abs. in Zentbl. Expt. Med., 4 (1913), No. 12, p. 540*).—Thymus-cleaving ferments were noted in 51 out of 55 sera coming from healthy humans varying in age from 4 to 70 years.

Observations on the protective enzyms of the body (Abderhalden), E. G. GREY (*Bul. Johns Hopkins Hosp., 25 (1914), No. 278, pp. 117–122*).—This reports the results of a study of the Abderhalden (protective enzym) method, with a view to ascertaining the relationship of these enzyms to epithelial transplants. The ferments are considered specific.

Diagnosis of malignant new formations and pregnancy with the Abderhalden method, G. VON GAMBAROFF (*München. Med. Wchnschr., 60 (1913), No. 30, p. 1644; abs. in Zentbl. Expt. Med., 5 (1914), No. 1, p. 17*).—In only 3 out of 50 cases of tumor were the findings negative. Serum from cases of carcinoma cleaves carcinomatous tissue but not sarcoma tissue. The inverse holds good also.

Experimental contribution to the diagnosis of pregnancy by Abderhalden's dialysis method, NAUMANN (*Deut. Med. Wchnschr., 39 (1913), No. 43,*

pp. 2086–2088; abs. in Berlin. Tierärztl. Wchnschr., 30 (1914), No. 2, p. 33).—With bovines it was possible to note by the Abderhalden procedure whether an animal was pregnant or not. At least 2 cc. of serum are necessary and the ninhydrin test is more satisfactory than the biuret test.

The need for a means of physical diagnosis of abortion, W. L. Williams, J. N. Frost, and R. R. Bolton (*Proc. Amer. Vet. Med. Assoc., 50 (1913), pp. 831–842, figs. 4*).—This is the original material with discussions, previously noted (E. S. R., 29, p. 500).

A study of the metabiotic action of the ultraviolet rays.—Production of mutation forms of the anthrax bacillus, Mme. V. Henri (*Compt. Rend. Acad. Sci. [Paris], 158 (1914), No. 14, pp. 1032–1035, pl. 1; abs. in Nature [London], 93 (1914), No. 2321, pp. 193, 194, figs. 3*).—Through the exposure of an aqueous suspension of sporing anthrax in a quartz tube to ultraviolet radiations for a period varying from 1 to 40 minutes and afterwards subculturing, the author has been able to produce artificial mutations of *Bacillus anthracis*. The majority of the organisms were destroyed by this treatment, but a few survived, and while most of these presented a normal aspect a few showed characters decidedly different from the typical anthrax bacillus. The principal of these were (1) coccoid forms which remained stable during a period of 2 months, and (2) thin filamentous forms not taking the Gram stain, not liquefying gelatin or curdling milk, and producing an affection different from anthrax on inoculation. The second form remained absolutely fixed after daily subcultures for more than 80 days, but, though stable in vitro, in vivo after passage through an animal Gram-positive coccoid forms made their appearance, and subsequently, after subculture in broth, a certain number of bacillary forms approximating to typical anthrax were obtained.

The efficacy of antitetanic serum, T. B. Rogers (*Vet. Rec., 26 (1914), No. 1330, p. 419*).—The mortality from tetanus is much lower since antitetanic serum has been introduced into veterinary therapeutics. In the article a comparison is made with pre-antitoxin days.

Diagnosis of tuberculosis in test animals with von Pirquet's reaction, E. Conradi (*München. Med. Wchnschr., 60 (1913), No. 29, pp. 1592–1594; abs. in Berlin. Tierärztl. Wchnschr., 30 (1914), No. 2, pp. 30, 31*).—It is stated that the only certain method of diagnosing tuberculosis is the animal test but this generally requires about 6 weeks. The author proposes to shorten this period by testing the guinea pigs with von Pirquet's cutaneous tuberculin test, and in his experiments, using guinea pigs and rabbits, he has reduced the time to about 10 to 13 days. It is, however, necessary to follow von Pirquet's specifications closely and to use a diluted, old tuberculin.

The value of the optical method and the dialysis procedure in infectious diseases.—Investigations about tuberculous bovines, E. Abderhalden and P. Andryewsky (*München. Med. Wchnschr., 60 (1913), No. 30, pp. 1641, 1642*).—The most suitable animals in the preliminary experiments were found to be dogs and rabbits. Guinea pigs which were not infected with tubercle bacilli cleaved a substrat made of tubercle bacilli. Animals receiving finely suspended boiled tubercle bacilli into the blood stream showed protein or peptone cleaving ferments 3 days post injection. The same was noted after injecting tubercle bacilli peptone or living tubercle bacilli.

In the experiments with cattle which came to slaughter the results were less favorable, as out of 50 cases of localized tuberculosis only 10 gave positive reactions. Where cleavage was obtained with the bovine sera it was practically always with a substrat prepared from the bovine type of bacillus and miliary tuberculosis was present. When, however, lung tissue containing caseous areas were boiled out and used as a substrat for the dialysis method or con-

verted into peptone for the optical method, the results showed positive for the pulmonary cases and negative for the miliary cases. The reaction in its present stage is not entirely reliable, especially as 10 sera out of 50 from normal animals gave positive tests.

Peptone was also prepared from glanders bacillus and then mixed with the sera of sound and glandered horses. The optical methods showed cleavage with the glandered sera.

Some remarks about Carl Spengler's fragment sputa, F. MAFFI (*Centbl. Bakt. [etc.], 1. Abt., Orig., 69 (1913), No. 7, p. 555, pl. 1*).—This short article is accompanied by a plate showing microscopical preparations of the so-called fragment (Splitter) sputa organisms which are found in the sputum of tuberculous subjects. In only one instance were fragmentary, granular, and normal forms of bacilli noted at the same time. The investigations are to be continued for the purpose of determining the significance of acid-fast organisms with reference to ordinary bacilli and Much's forms.

The production of artificial immunity against tuberculosis in domestic animals, S. H. GILLILAND and C. J. MARSHALL (*Proc. Amer. Vet. Med. Assoc., 50 (1913), pp. 719–753*).—This is a résumé of experiments carried on for several years by the State Live Stock Sanitary Board of Pennsylvania, and deals especially with the Pearson method of immunizing against tuberculosis.

"Intravenous injections of tubercle bacilli from human sources, nonvirulent for cattle, are capable of conferring an immunity in cattle against tuberculosis sufficient to withstand natural infection by association with tubercular cows. The length of the immunity has not been determined accurately, though it is believed to diminish gradually after 2½ years. It is necessary that the animals, during the period of vaccination and for at least 8 weeks following the last vaccination, be kept in a manner that they are in no way exposed to tubercular infection.

"The normal resistance of the animal is apparently lowered during the period of vaccination. The number of vaccinations and the amount of vaccine administered have a direct relation to the degree of immunity conferred. The interval between vaccinations should be of sufficient length to allow the reaction following the previous vaccination to subside entirely.

"The results of the experiments lead us to be hopeful that the day may come when animals can be immunized against tuberculosis in common practice. Until further knowledge is obtained in regard to the destruction or outcome of the living tubercle bacilli injected in the animal with the vaccine, no practical method for the immunization of animals under ordinary conditions can be advocated."

See also other notes (E. S. R., 25, p. 288).

Control of tuberculosis in Minnesota pure-bred herds, S. H. WARD (*Proc. Amer. Vet. Med. Assoc., 50 (1913), pp. 824–830*).—Previously noted from another source (E. S. R., 29, p. 500).

Some aspects of the tuberculosis problem, M. P. RAVENEL (*Proc. Amer. Vet. Med. Assoc., 50 (1913), pp. 88–98*).—Previously noted from another source (E. S. R., 29, p. 499).

Some common ailments of the horse and cow, C. A. LUEDER (*W. Va. Farm Bul., 1 (1914), No. 5, pp. 16, figs. 5*).—This is a popular account.

On the value of the "abortin" as a diagnostic agent for infectious abortion in cattle, K. F. MEYER and J. B. HARDENBERGH (*Jour. Infect. Diseases, 13 (1913), No. 3, pp. 351–374, figs. 5; Proc. Amer. Vet. Med. Assoc., 50 (1913), pp. 862–876*).—"The serum tests, agglutination and complement fixation, are the most reliable methods to determine the existence of infectious abortion in a herd and to detect the bovines which are or have been infected with *Bacillus*

abortus. The abortin test in the form and with the preparation recommended by the English Commission is unreliable and misleading.

"Encouraging results are obtained with a precipitated purified abortin by intravenous application. The reaction is not absolutely specific as a high percentage of healthy animals react to the injection of abortin products. This nonspecificity is more frequently observed with an ordinary plain abortin than with our purified product. By means of the abortin test we can not decide whether an animal has been recently infected and will abort, or whether it is recovering from an invasion with *B. abortus*."

Bush sickness.—Field experimental and demonstration work, C. J. REAKES and B. C. ASTON (*Jour. Agr. [New Zeal.], 8 (1914), No. 2, pp. 160–165, figs. 2*).—The information gained from investigations carried on in continuation of those previously noted (E. S. R., 30, p. 83) is summarized as follows:

"The most susceptible class of dairying cattle, namely, first calf heifers, can be kept healthy and made profitable for dairying purposes for at any rate a considerable time when grazed upon paddocks suitably top-dressed. . . . Animals of the same age and class will develop bush sickness in a few months when grazed upon similar land not top-dressed even with plenty of feed, good shelter, and access to standing bush. Syrup of phosphate of iron in solution is a valuable curative agent when given daily over a sufficiently long period. Breeding ewes grazed upon suitably top-dressed paddocks will remain healthy over a much longer period than these animals will do when kept upon land not top-dressed."

Investigations of coital exanthema of cattle, ZWICK and GMINDER (*Berlin. Tierärztl. Wchnschr., 29 (1913), No. 36, pp. 637–640*).—The authors conclude that the cause of this disease is not a filterable virus. The horse, goat, and sheep are resistant to the virus.

Atoxyl in the treatment of malignant catarrhal fever of cattle, E. WYSSMANN (*Schweiz. Arch. Tierheilk., 55 (1913), No. 7, pp. 361–371; abs. in Vet. Rec., 26 (1914), No. 1332, p. 450*).—The author, who considers the disease to be a bacterial toxemia, recommends the injection of atoxyl following a copious bleeding. He reports having obtained very encouraging results from this treatment.

Pasteurellosis in the reindeer and a contribution to the knowledge of the biological characteristics of the pasteurella, H. MAGNUSSON (*Ztschr. Infectionskrank. u. Hyg. Haustiere, 15 (1914), No. 1, pp. 61–92, figs. 6*).—This is a detailed report of studies conducted at the Government Veterinary Bacteriological Laboratory at Stockholm in which the author finds the disease to be the same as that of deer, known in Germany as "Wildseuche." He finds the pasteurella organism to be resistant to low temperature and to changing temperatures near the freezing point, and to survive putrefaction for 6 months without attenuation.

Sanitary police measures and hog cholera, A. T. KINSLEY (*Amer. Vet. Rev., 44 (1913), No. 2, pp. 227–231; Proc. Amer. Vet. Med. Assoc., 50 (1913), pp. 684–703*).—A statement in regard to the prevalence of hog cholera in the United States at the present time. The total losses in the United States for 1912 approximated $100,000,000, and those in Iowa, Nebraska, Kansas, and Missouri over $30,000,000. So far as can be determined from available statistics these relative losses have never been exceeded or equaled, and have occurred regardless of the fact that large quantities of antihog cholera serum have been used.

The inadequacy of present legislation and sanitary measures in controlling the pest is given as one of the causes of the prevalence of hog cholera.

Abortion in mares caused by Bacillus paratyphosus, T. VAN HEELSBERGEN (*Centbl. Bakt. [etc.], 1 Abt., Orig., 72 (1913), No. 1–2, pp. 38–70, figs. 2*).—A

detailed report of studies carried on in continuation of those reported by de Jong, previously noted (E. S. R., 28, p. 886).

While the portal of entry has not been positively determined, the bacillus is thought to be ingested by the horse in its feed.

Colics and their treatment, edited by D. M. CAMPBELL (*Chicago, 1914, pp. 137*).—This is the third volume of the Veterinary Medical Series (E. S. R., 27, p. 377; 31, p. 88). Its contents include Differentiation of the Various So-called Colics, by R. P. Lyman, Stomach Lavage in Acute Indigestion of the Horse, by D. O. Knisely, Surgical Treatment of Colics in Horses, by L. A. Merillat, Impaction of the Cecum in the Horse, by A. T. Gilyard, Colics in the Horse, by D. S. White, and Medicinal Treatment of Colic in the Horse, by E. L. Quitman.

The diagnosis of dourine by complement fixation, J. R. MOHLER, A. EICHHORN, and J. M. BUCK (*Proc. Amer. Vet. Med. Assoc., 50 (1913), pp. 467–484*).—Previously noted from another source (E. S. R., 30, p. 83).

Equine piroplasmosis: Types of parasites, M. CARPANO (*Centbl. Bakt. [etc.], 1. Abt., Orig., 73 (1914), No. 1, pp. 13–41, pls. 3, figs. 6*).—The author describes two piroplasms which occur in horses in Italy, one a small variety named *Nuttallia equi* by França, and most frequently encountered; the other a large variety, first distinguished by Nuttall as *babesia caballi*. That the two piroplasms are distinct has been shown by inoculation of an animal, which has recovered from or become immune to one, with the other. The author states that there are two ticks which infest Italian horses, namely, *Rhipicephalus bursa* and *Margaropus (Boophilus) annulatus*, that are probably responsible for the transmission of these piroplasms.

A bibliography is appended.

Culture of equine piroplasms and views of the nature of anaplasms, M. CARPANO (*Centbl. Bakt. [etc.], 1. Abt., Orig., 73 (1914), No. 1, pp. 42–53, pl. 1*).—The author describes the artificial culture of the parasites mentioned in the article noted above in blood mixed with a solution of sodium chlorid and sodium citrate. *Babesia caballi* remains alive in this medium for many days, but does not reproduce. *Nuttallia equi* reproduces, as in the blood, by division and ultimately leads to the formation of small Anaplasma forms, regarded as resistant stages.

Further investigations of contagious pleuro-pneumonia of the horse, GAFFKY and LÜHRS (*Ztschr. Veterinärk., 25 (1913), No. 1, pp. 1–11, pls. 5; abs. in Cornell Vet., 4 (1914), No. 1, pp. 49–51*).—This is a report of further investigations (E. S. R., 28, p. 482) conducted in the Imperial Institute for Infectious Diseases.

The authors' conclusions are as follows:

"The local changes in the lungs begin in the finest branches of the air passages. In the beginning of the disease there is secreted a glassy, transparent, slightly gelatinous, yellowish material. This is surrounded by a thick layer of cells and a serous infiltration. In the region of the affected bronchi the alveoli are filled with a fluid rich in cells. In those places where the disease foci are near the pleura there is an infiltration of the subpleural tissue with a transparent, yellowish, gelatinous fluid. The interlobular connective tissue is infiltrated with serum. On the fourth or fifth day, not before, bacteria begin to colonize in the diseased parts of the lung in the form of cocci arranged in chains. These cause inflammatory, often hemorrhagic, changes that may lead to extensive necrosis.

"Transmission from horse to horse is usually direct. The incubation period is at least 16 days, usually from 20 to 40 days, and over. Injection into susceptible horses of the blood or parts of diseased organs from horses affected with

contagious pleuro-pneumonia does not transmit the disease. It may be transmitted, but not always, by placing bronchial secretions on the mucous membranes of the uninjured nasal cavity or mouth. The ciliated epithelial cells in the bacteria-free secretions of the bronchi show peculiar inclosures which seem to be the result of degenerative changes rather than parasites.

"Horses that had been injected with the pulverized parts of diseased lungs, and which did not thus contract this disease, could not afterwards be infected by the usual method. Foci of lung tissue rubbed up with glycerin and preserved for a long time seem to prevent a later infection when injected into the lungs or under the skin."

Spirochetosis of fowls. KIESSIG (*Centbl. Bakt. [etc.], 1. Abt., Ref., 61 (1914), No. 7, pp. 193–208*).—This review of the literature on the subject includes a bibliography of 59 titles.

The staining of microfilariæ. F. FÜLLEBORN (*Centbl. Bakt. [etc.], 1. Abt., Orig., 73 (1914), No. 6, pp. 427–444, pls. 2, figs. 3*).—A discussion of the technique.

The disinfective action of Cresepton in comparison with creolin and liquor cresoli saponatus. WOLFF-EISNER (*Deut. Tierärztl. Wchnschr., 21 (1913), No. 44, pp. 702–704; abs. in Berlin. Tierärztl. Wchnschr., 30 (1914), No. 1, p. 9*).—The author having conducted experiments concludes that liquor cresoli saponatus, creolin, and Cresepton are very similar in their disinfective action, and that their cost is the first thing to be considered.

RURAL ENGINEERING.

Twelfth annual report of the Reclamation Service, 1913 (*Ann. Rpt. Reclamation Serv. [U. S.], 12 (1913), pp. 382*).—This report relates in particular to work completed and in progress during the fiscal year ended June 30, 1913, with explanatory information regarding previous operations.

Report of irrigation and reclamation works department (*Rpt. Irrig. and Reclamation Works Dept. So. Aust. 1913, pp. 27, pls. 7*).—This report covers the period from August, 1910, to June, 1913.

Irrigation studies. A. MÜNTZ and E. LAINÉ (*Vie Agr. et Rurale, 2 (1913), No. 48, pp. 557–559*).—Studies of module, grade, state of vegetation, permeability of the soil, and unit area of the plat to be irrigated, relative to economy in the use of irrigation water, are briefly noted. It is concluded that a rational choice and consideration of these factors will in a large measure reduce the use of irrigation water in excess of that amount actually required by the crop.

Quantity of water consumed in the cultivation of sugar cane. J. GUARDIOLA (*Bol. Dir. Gen. Agr. [Mexico], Rev. Agr., 2 (1912), No. 2, pp. 101–107*).—Methods of computing the amounts of water necessary for the irrigation of sugar cane are outlined, as governed by local conditions relating to duty of water, soil, climate, and rainfall.

The control of water as applied to irrigation, power, and town water supply purposes. P. A. M. PARKER (*New York, 1913, pp. VII+1055, figs. 273; rev. in Engin. News, 71 (1914), No. 12, pp. 646, 647*).—This is a rather extensive contribution to the literature of applied hydraulics containing a large number of data, formulas, and mathematical demonstrations. The chief topics discussed are the theory of hydraulics, gaging of streams and rivers, weirs and weir formulas, orifices, collection of water and flood discharge, dams and reservoirs, open channels, filtration and purification of water, municipal water supplies, irrigation, and silting in canals.

Under gaging of streams and rivers a novel method called chemical gaging is described. In the remaining chapters of the book are treated such varied

subjects as movable dams, hydraulic machinery, the hydraulics of contracting and expanding pipes, valves and valve motions, water-hammer, ejectors, siphons, the removal of air from siphons, air lifts, air compression, hydraulic rams, resistance of motion of solid bodies in water, impact of water, turbines, and centrifugal pumps. The work closes with a brief treatise on concrete, iron, and other materials used in hydraulic construction.

The area of waterways. J. VICARS (*Rpt. Austral. Assoc. Adv. Sci., 13 (1911), pp. 622–629*).—The author endeavors to demonstrate the inadequacy of the existing formulas for run-off used in determining the area of waterways for carrying off storm water. In addition he presents his own formula, which he believes embodies the primary essentials governing flood discharge and may be applied to any locality.

Loss of head due to bends in water pipes. W. E. FULLER (*Canad. Engin., 26 (1914), No. 11, pp. 441–443, figs. 4*).—In this article the loss of head due to 90° bends is considered as that portion of the total loss in excess of the loss which would occur in an equal length of straight pipe. Data from various experiments indicate that the loss is more nearly the same for different sizes of pipe with bends of the same actual radius in feet than for the bends of the same radius in terms of pipe diameters.

Average values of the loss of head for different velocities due to bends of the same radius show that the loss is proportional to $v^{2.25}$, from which the formula $hb=kv^{2.25}$ is deducted in which hb is the loss of head, k is a coefficient varying with the radius of bend, and v equals the velocity.

The computations in which the actual lengths of the tangents to the curve were assumed as the straight pipe brought out the following points: The excess loss of head in bends is greater for large pipes than for small ones, and for large pipes a 6-foot radius bend gives the least resistance unless very long radii are used. "For small pipes . . . with long radii the loss of head will be less than it would be in straight pipe of a length equal to the tangents of the curve." For losses due to 45° bends it is suggested that three-fourths of that due to 90° bends of the same radius be used; for 22.5° one-half, and for a Y-branch three-fourths of that due to a T.

Drainage and irrigation: Drainage ditch and levee tables for level section with explanation of method of computation. E. S. BLAINE (*Engin. and Contract., 41 (1914), No. 10, pp. 302–306, fig. 1*).—A table is given of volumes of excavation in cubic yards per 100 linear feet of ditch in level sections, having side slopes of 1 on 1 and bottom widths of from 4 to 123 ft. The volumes are calculated to correspond to tenths of feet in depth. The method of computation was by use of second differences, calculating them by addition within the limits of the table. A demonstration shows that the second difference not only remains constant for prisms having the same slope, but also that the second differences for other slopes are a multiple of this quantity if the slopes are the same on both sides of the section. If not the same, then it is a multiple of the average of the two slopes.

Drainage and irrigation: Linings for small storage reservoirs. C. R. SESSIONS (*Engin. and Contract., 41 (1914), No. 10, pp. 304–306*).—The author discusses clay, plastered cobble, concrete, and asphaltum and oil linings for small storage reservoirs, but is of the opinion that of these the clay puddle lining is probably the cheapest and best.

Machine for testing drain tile. D. A. ABRAMS (*Engin. News, 71 (1914), No. 12, p. 614, fig. 1*).—A tile testing machine which is used in the laboratory of applied mechanics of the University of Illinois is illustrated and its construction and operation briefly described.

Street pavements and paving materials. G. W. TILLSON (*New York and London, 1912, 2. ed., pp. XVI+651, pl. 1, figs. 97*).—This book contains chapters on the history and development of pavements; stone; asphalt; brick-clays and the manufacture of paving-brick; cement, cement mortar, and concrete; the theory of pavements; cobble and stone-block, asphalt, brick, wood, broken-stone, and concrete pavements; plans and specifications; the construction of street-car tracks in paved streets; width of streets and roadways, curbs, sidewalks, etc.; asphalt plants; and the protection of pavements.

Fourth American Good Roads Congress and tenth annual convention of the American Road Builders' Association (*Good Roads, n. ser., 7 (1914), Nos. 1, pp. 3–59; 6, pp. 91–126*).—These proceedings include a number of special papers which deal with different phases of the design, construction, maintenance, and repair of different types of roads and with road administration.

Road laws of the State of Washington (*Olympia, Wash., 1913, pp. 263*).—These laws relate to road construction, financing, and administration.

Practical handbook of gas, oil, and steam engines. J. B. RATHBUN (*Chicago, 1913, pp. 370; rev. in Sci. Amer., 110 (1914), No. 10, p. 212*).—This book deals in condensed form with the construction, operation, and repair of all kinds of engines, with the various parts in detail, and with the different kinds of fuel.

The construction and design of internal combustion motors. H. GÜLDNER (*Das Entwerfen und Berechnen der Verbrennungskraftmaschinen und Kraftgas-Anlagen. Berlin, 1914, 3. ed. rev., pp. XX+800, figs. 1282; rev. in Engin. News, 71 (1914), No. 12, p. 648*).—This book is meant primarily for the designer of internal combustion engines. It contains many detailed drawings of parts, assembled drawings of complete machines, and tables of performance, as well as data on the fundamental theory that is necessary in design.

A fuel-saving device for oil engines. E. R. ADLINGTON (*Gas Engine, 16 (1914), No. 2, pp. 84–86, figs. 3*).—Tests of a recarbureting device for remixing and increasing the uniformity of the gasoline and air mixture are reported. The device consisted of a rapidly revolving fan placed in the intake pipe.

Curves of results obtained with and without the recarbureter showing brake horsepower platted against pounds of gasoline per brake horsepower hour, percentage of thermal efficiency, and revolutions per minute all point more or less favorably toward the use of the recarbureting device. It is concluded that the points in favor of such a device are (1) reduction in gasoline consumption, (2) increased engine capacity, (3) higher speed at maximum loads, and (4) greater thermal efficiency.

Fuel consumption and effective utilization of energy in small power motors. CHARBONNIER (*Maschinen Ztg., 12 (1914), Nos. 1, pp. 4–8; 2, pp. 19–22*).—The author gives tables of data comparing the fuel consumption, effective utilization of energy, and cost of operation per effective horsepower hour for portable saturated and superheated steam engines, gas and crude oil engines, and electric motors of from 5 to 20 horsepower, operating at $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, and full load.

The electric motors showed the least increase in fuel consumption per effective horsepower hour with decrease from full to $\frac{1}{4}$ load, followed in order by the superheated and saturated steam engines, and the crude oil and gas engines. The crude oil engines showed the highest effective utilization of heat units in fuel per effective horsepower hour from full to $\frac{1}{4}$ load, followed in order by the gas engines, the electric motors, and the superheated and saturated steam engines.

Using German prices for coal, gasoline, crude oil, and electricity per 10,000 heat units, it is shown that on the basis of the results obtained for fuel consumption and energy utilization the crude oil engine is the most economical

in sizes from 5 to 20 horsepower when operating at ¼ to full rated capacity, followed in order by the superheated and saturated steam engines, the gas engines, and the electric motors. It is stated, however, that utilization by the mechanical means available of the waste heat will place the steam engines ahead of the crude oil engines as regards economy.

The possibilities of mixed fuels (*Gas Engine, 16 (1914), No. 2, pp. 120, 121*).—Tests on a 4-cylinder engine of 3.54 by 5.12 in. bore and stroke, using gasoline, benzol, or mixtures of benzol and methylated spirits 1:1, 1:2, and 1:3 showed that on none of the mixtures of methylated spirits and benzol did the engine run steadily under load unless the temperature of the jacket of the induction pipe was at least 160° F. The benzol took less air than gasoline, and the more methylated spirit in the mixtures the smaller was the quantity of air required.

The engine at 1,000 revolutions per minute gave 1.25 per cent less power and used 15.5 per cent less benzol; 1 per cent less power and used 3.7 per cent less of the 1:1 benzol-methylated spirit mixture; 8 per cent less power and used 8.9 per cent more of the 1:2 mixture; and 8.5 per cent less power and used 24.5 per cent more of the 1:3 mixture than when running on gasoline. Later experiments using the 1:1 mixture in a high speed engine up to 2,000 revolutions per minute "show that with the slightly increased compression obtained in this engine, it was possible to get an explosive mixture which would burn rapidly enough to exert at least as much power as gasoline with a piston speed of about 2,000 feet per minute."

Fuel-briquetting investigations, July, 1904, to July, 1912, C. L. Wright (*U. S. Dept. Int., Bur. Mines Bul. 58 (1913), pp. IX+275, pls. 21, figs. 3*).—This bulletin reports briquet tests made with a large number of fuels from different parts of the United States and also laboratory tests of briquet binders. The advantages of briquetted fuel are noted as more regular, thorough, and smokeless combustion, better draft, little clinkering, less need of care in firing, greater evaporative power, better weather resisting qualities, higher rates of combustion, less breakage during transportation, no spontaneous combustion, less space required in storage, and higher heating values.

Among a large number of other tests were tests of briquets in a kitchen range and in a heating grate. The briquets ignited readily, making a hot fire, and burned freely until consumed. Little shaking or poking of the fire was needed to obtain maximum efficiency from the fuel, and the loss of unburned fuel through the grates was not excessive and could be reduced by using step grates or grates with narrow spaces between the bars. A grate measuring 8 by 24 in. was big enough for heating a large room with briquets. Under the test conditions little smoke was made.

It is concluded that briquets should prove a satisfactory domestic fuel.

Mechanics for builders, I, E. L. Bates and F. Charles (*New York, 1913, pp. 201; rev. in Sci. Amer., 110 (1914), No. 10, p. 212*).—This book is meant for students of building construction who desire to perfect themselves in the principles of form and design. It selects from the larger study such subjects as bear directly upon building problems and gives a thorough grounding in strength of materials and theory of structure.

The testing of sand for use in concrete, I, II, C. M. Chapman (*Engin. News, 71 (1914), Nos. 6, pp. 306–310, figs. 7; 11, pp. 554–558, figs. 2*).—Part 1 of this article describes methods of sampling and testing sand for use in concrete, and part 2 gives methods of reducing to useful form the laboratory and field data from such testing of samples.

Some tests on strength of overwet concrete (*Engin. News, 71 (1914), No. 11, pp. 587, 588, fig. 1*).—Data and curves of tests show the effect of variation in water content in concrete and the deleterious effect of using too much water.

Use of hydrated lime in concrete pavements, R. S. EDWARDS (*West. Engin., 4 (1914), No. 3, pp. 209–215; Nat. Lime Manfrs. Assoc. Bul. 1 (1914), pp. 12*).—The author points out that small percentages of hydrated lime when added to concrete mixtures in road work will render the concrete highly plastic and homogeneous, thus producing density and uniformity in the finished concrete, will keep a certain amount of excess moisture in the concrete while setting, will render the concrete mass more nearly watertight, thereby preventing alternate wetting and drying of the finished concrete, and will reduce the labor of spreading and finishing.

Exterior plastering specifications (*Cement and Engin. News, 26 (1914), No. 3, pp. 70–73, figs. 5*).—These specifications include materials, preparation of mortar, structure, mortar coats, finish, and overcoating.

Modern practice in heating and ventilation. XIV, A. G. KING (*Dom. Engin., 66 (1914), No. 11, pp. 328–331, figs. 10*).—Special fittings and devices for hot water circulation in domestic heating are described and suggestions given for their installation.

Handbook on sanitation, G. M. PRICE (*New York, 1913, 3. ed., rewritten, pp. 353, figs. 25; rev. in Sci. Amer., 110 (1914), No. 10, p. 212*).—The first part of this book covers soil and sites, air, ventilation, heating, water supply, sewage disposal, and plumbing. The second part is devoted to sanitary practice and deals with the problems of housing, of trades and occupations, and of disinfection. The third part relates to sanitary inspection as a profession and includes calculations and tables.

The new public health, H. W. HILL (*Minneapolis, Minn., 1913, pp. VI+128; rev. in Engin. News, 71 (1914), No. 12, p. 646*).—Public health as here considered relates almost wholly to communicable or infectious diseases. It is the aim to control these at the source, which is the infected person, by measures which will prevent infective material from escaping to other people. Among other topics, the author discusses under the general heading of "community defense," the public-health engineer, laboratory, and statistician.

Hygiene of rural, suburban, and summer homes (*Bd. Health Maine Circ. 100, pp. 44, figs. 23*).—This paper points out the essentials in the structure, arrangements, and surrounding of homes to insure their healthfulness, particularly referring to the requirements of farm and suburban houses and summer homes in the State of Maine. The discussion includes such topics as location for the home, relative position of the house and other buildings, relative arrangement of rooms, warming of houses, food supply, water supply, disposal of wastes, water carriage systems, and the typhoid fly.

A rapid method of determining the probability of decomposition occurring in a sewage effluent, E. S. STOKES (*Rpt. Austral. Assoc. Adv. Sci., 13 (1911), pp. 679–688*).—The author describes tests, gives data of results, and concludes "that a very fair idea may be obtained as to the probability of decomposition occurring in a sewage effluent by calculating the ratio between the oxygen absorbed and the oxygen in nitrites and nitrates." This ratio he states can be worked out by the following formula: Decomposition factor=N (as N_2O_3)×1.71+N (as N_2O_5)×2.86÷oxygen absorbed in 4 hours. For a satisfactory effluent it is thought that this factor should exceed 0.7.

Lighting of medium sized and small towns and rural communities, H. STRACHE and F. EISLER (*Beleuchtung mittlerer und kleiner Städte und Ortschaften. Technische Praxis, Vienna and Leipsic, 1913, pp. 234, figs. 23; rev. in*

Gsndhts. Ingen., 37 (1914), No. 7, p. 127).—The authors deal with lighting by coal gas, electricity, gasoline, blau gas, water gas, acetylene, petroleum, and petroleum and alcohol incandescent lamps. The book is written for both the engineer and layman.

General discussion on conveniences in the home and on the farm, N. MONTEITH (*Ann. Rpt. Ontario Agr. and Expt. Union, 34 (1913), pp. 79, 80*).—Some general data are brought together.

RURAL ECONOMICS.

Factors of efficiency in farming, W. J. SPILLMAN (*U. S. Dept. Agr. Yearbook 1913, pp. 93–108*).—The author maintains that on farms that combine a large number of the following factors in production, the profits are greater than on those which are efficient in only a few: The size of the business, whether measured by area of land farmed, amount of working capital employed, or number of days of productive labor determines the size of the income. The system of management of the various factors of production should be such that there is no lost motion or useless work. The enterprises conducted should be adaptable to the local soil and climate, and also to the existing economic conditions. There must be an adequate income both per acre and per animal or the one may offset the other.

Data illustrating these various factors are presented and discussed.

Reorganizing the farm, J. M. JOHNSTON (*Bul. N. C. Dept. Agr., 35 (1914), No. 1, pp. 61–65*).—The author by using census data computes for four counties the average size and area in crops and unimproved land per farm, as well as the average acreage cropped per work horse, and the number of days of horse labor per year. By a more extensive use of land already in farms and the working of the horses a greater number of days, the author estimates that the farmer's income could be greatly increased with only a small additional investment.

The organization of rural interests, T. N. CARVER (*U. S. Dept. Agr. Yearbook 1913, pp. 239–258, figs. 8*).—The author points out that the improved means of transportation, mechanical inventions, the passing away of common local interests, and the public land policy have tended toward a disorganization of the rural communities. Efforts at reorganization through mutual insurance companies, cooperative creameries and cheese factories, and cooperative elevators are graphically illustrated. It is maintained that the various scattered movements should be brought together by a permanent body, such as the Rural Organization Service. Organization is deemed especially essential in marketing operations, the development of credit facilities, and the protection of the farm home against disease. The method of procedure and principles to be observed are briefly discussed. In cooperative enterprises an accurate system of account keeping and auditing, and a desire to eliminate waste and inefficiency, must be maintained. Organization for marketing purposes calls for the improvement and standardizing of the products and the acquainting the consumer with the goods by a system of labeling. Some of the disadvantages of unnecessary credit to the farmer are pointed out, and it is stated that the function of the cooperative credit organization should be to furnish it only where it can be used to advantage.

An experiment in marketing under territorial auspices, E. V. WILCOX and A. T. LONGLEY (*Hawaii Sta. Press Bul. 45 (1914), pp. 27*).—The territorial marketing division established under the supervision of the station (E. S. R., 30, p. 600) is now handling about 150 shipments of farm products per month. It issues weekly lists of prices and of buyers and sellers of pure-bred stock and of

seeds, and by improving the methods of handling, grading, and packing farm produce has been able not only to increase the profits of farmers but to stimulate them to greater efforts along the lines of diversified agriculture. The consumer has been benefited by having a more even and better graded supply of farm produce. The requirements of the division in the future are noted. The demand, methods of preparing for market, and range of prices are given for a long list of farm produce adapted to Hawaii.

The farmers' cooperative exchange, A. E. CANCE (*Mass. Agr. Col., Ext. Serv. [Pub.], 1914, pp. 34*).—The author outlines the principles that should serve as a guide to farmers desiring to form cooperative societies for buying agricultural supplies or collecting, shipping, selling, storing, and manufacturing farm products. Among the essentials to success pointed out are that a given community should have sufficient material to do a cooperative business, that the cooperative area should be small, that the members be loyal and have but a single purpose in cooperating, that a good manager be employed and be given sufficient money to advertise and to do business on a cash basis, and that incorporation be on the principle of "one man one vote." He also calls attention to some of the possible fields of agricultural cooperation in New England and suggests forms that may be used in establishing cooperative exchanges.

Monographs on agricultural cooperation in various countries (*Inst. Internat. Agr. (Rome), Serv. Inst. Econ. et Soc., 2 (1914), pp. VII+238*).—This is a continuation of the monographs previously noted (E. S. R., 27, p. 590), and contains notes and statistics on the movement of agricultural cooperation in Argentina, the development and actual conditions of agricultural cooperation in Austria, agricultural cooperation in Hungary, Croatia and Slavonia, and Italy, and the organization of agriculture in Switzerland. Accompanying each section is a series of demographic and economic statistics and a bibliography.

Agricultural cooperation and rural credit in Europe.—Bibliography (*U. S. Senate, 63. Cong., 1. Sess., Doc. 214, pt. 2 (1913), pp. 79*).—This document contains a complete bibliography of the literature on the agricultural credit and cooperative systems of European countries collected by the American Commission (E. S. R., 30, p. 492).

How to use farm credit, T. N. CARVER (*U. S. Dept. Agr., Farmers' Bul. 593 (1914), pp. 14*).—The nature and use of capital are discussed, and it is pointed out that with the increase in the value of land and the use of machinery has arisen increased demand for credit or capital. Some of the important rules mentioned as to the use of credit are to make sure that the purpose for which the borrowed money is to be used will produce a return greater than needed to pay the debt, rather than merely pay living expenses, that the length of time a debt is to run has a close relation to the productive life of the improvement for which the money is borrowed, and that for long-time loans arrangements be made for gradual reduction of the principal.

Included in this publication are a series of amortization tables showing the annual payment necessary to pay off a debt of $1,000 under varying rates of interest and periods of time.

The rural credit situation of the United States, H. MACPHERSON (*Oreg. Countryman, 6 (1914), No. 7, pp. 371–373*).—The author includes among the essentials necessary to afford the farmer proper credit facilities that the credit system should aim at service and not at dividends on stocks, and that it should have local banks with a central bank as a clearing house, a system of repayment on the amortization plan, an effective system of floating the bonds on farm mortgages, and a simplification of the present land registry system. The author points out some of the defects in pending legislation.

The problem of agricultural credit in Canada, H. MITCHELL (*Bul. Depts. History and Polit. and Econ. Sci., Queen's Univ. Canada, No. 10 (1914), pp. 24*).—The author describes the German Landschaften, the Caisses Populaires of Quebec, and the state government loans in Australia with a view of determining their adaptability to conditions in Saskatchewan. He concludes that the Landschaft, modified to suit local conditions, is the most adaptable of the three types mentioned.

Loans granted by the state bank on security of grain and the establishment of grain elevators in Russia (*Internat. Inst. Agr. [Rome], Mo. Bul. Econ. and Soc. Intel., 5 (1914), No. 3, pp. 85–94*).—The lack of funds or the means of obtaining credit formerly made it necessary for the Russian peasant to sell his grain immediately after harvest. Generally at this period of the year the condition of the grain market was very unfavorable. In 1885 banks were authorized to grant loans on grain stored in certain buildings designated by the bank. In 1894 the law was modified so that the peasant could borrow on his grain wherever it happened to be located, and whether thrashed or not. The rate of interest varied from 4½ to 6 per cent, and the loan was required to be repaid within 9 months. In 1896 the term of repayment was limited to 6 months and the granting of loans was somewhat restricted. In recent years the Government has made vigorous efforts to develop the loan business through the medium of the zemstvos, cooperative credit societies, private credit institutions, and railways. In 1910 it decided to establish a system of state elevators, and through those in charge of the elevators the rate of loans, the methods used in classifying grains, and the standards are established.

[Distribution of produce between landlord and tenant], E. JENNY (*Staats u. Soz. Wiss. Forsch., No. 171 (1913), pp. XVIII+346*).—The author discusses systems, history, legal status, elements, and social influence of the distribution of farm produce between landlord and tenant, and describes in detail the distribution on a large estate in Russia during the years 1891 to 1910. An extensive bibliography is included.

Agricultural distribution of land in different countries (*Inst. Internat. Agr. [Rome], Pub. Bur. Statis. Gén., No. 5 (1914), pp. IV+310*).—The total land surface is classified as productive and nonproductive, and the productive areas are further subdivided into arable land, natural meadows and pasture land, tree and shrub plantations, woods and forest, and marshes, moors, and uncultivated productive lands. For the arable land there are given the areas devoted to cereals, to grasses and forage crops, and to other arable land crops and fallows.

In addition to the summary tables showing data for 36 countries according to the classification outlined above, data are given for each country showing the area devoted to individual crops so far as the information is available.

Farm lands in New Jersey, F. DYE ET AL. (*Trenton, N. J.: State Bd. Agr., 1913, 2. ed., pp. 53, pls. 12*).—This report contains a detailed description by counties of the natural characteristics and systems of farming and the possible development of agriculture in this State.

Uses of land in Denmark, July 15, 1912 (*Danmarks Statis. Meddel., 44 (1912), No. 2, pp. 175*).—This report contains statistical data showing the areas devoted to the various kinds of farm crops by minor geographic divisions. For the larger geographic divisions comparative data are given for 1896 and 1907.

Agriculture in Argentina, I. G. J. VAN DEN BOSCH (*Dept. Landb., Nijv. en Handel [Netherlands], Verslag. en Meded. Dir. Landb., No. 1 (1914), pp. 140, pls. 13, fig. 1*).—This report contains discussions of the physical features, immigration, live stock, agricultural machinery, crops, dairy and meat industry, and trade of Argentina.

[Agriculture in Guiana], edited by A. LEECHMAN (In *Handbook Brit. Guiana, 1913, pp. 153–185, pls. 6*).—The chapter on agriculture gives a description of the methods used in producing sugar, rice, coconuts, cacao, coffee, rubber, and fruits.

Rural development in Burma, H. CLAYTON (*Rangoon, India, 1911, pp. II+IV+114*).—The author outlines briefly the cooperative methods employed by farmers in Europe for the purchase of supplies, sale of farm produce, insurance of live stock, and securing of credit, and the modifications necessary to meet rural conditions in Burma.

Country life conference addresses (*Iowa State Col. Agr. Ext. Bul. 18, pp. 94, figs. 14*).—Contained in this report are a series of addresses on the economic phases of country life, by T. N. Carver; social phases, by C. S. Adams; and religious phases, by C. S. Adams, W. Hints, and P. A. Johnson.

Solving the country church problem, G. A. BRICKER ET AL. (*Cincinnati and New York, 1913, pp. 296, pls. 2, figs. 69*).—This is a series of articles by 14 authors treating of the various phases of the country church problem.

The agricultural outlook (*U. S. Dept. Agr., Farmers' Bul. 590 (1914), pp. 20, fig. 1*).—It is estimated that during the past year the losses of live stock from disease and exposure were 7,005,000 hogs valued at $73,000,000, 1,737,000 cattle valued at $68,611,000, 2,124,000 sheep valued at $8,581,000, and 523,000 horses valued at $59,100,000. It is shown that the monthly variation in the number of sheep and hogs is subject to greater fluctuation than the number of cattle. Directions are included for the use of anti-hog-cholera serum.

Statistics are given showing for Louisiana the cane production for 1911, 1912, and 1913, the condition of the principal crops in Florida and California, and for all the States the condition of winter wheat and rye on April 1, 1913, and 1914, the condition of the various kinds of live stock on the same dates, the estimated losses for the year ended March 31, 1914, and other statistical data relating to prices of agricultural products.

The agricultural outlook (*U. S. Dept. Agr., Farmers' Bul. 598 (1914), pp. 21*).—This number contains estimates of the conditions on May 1, 1914, of winter wheat, rye, hay, pasture, and honeybees, of the wheat fed to live stock, of the progress of spring plowing and planting, and of the prices of farm products. These estimates are shown by States and with comparative data for earlier years. The production of beet sugar, the sources of sugar supply of the United States, and the production of sugar in Hawaii are shown for 1913 and earlier years. A revised estimate of the acreage and yield of cotton for 1913 and data as to condition of crops in California and Florida are included.

Acreage and live stock returns of England and Wales, with summaries for the United Kingdom, R. H. REW (*Bd. Agr. and Fisheries [London], Agr. Statis., 48 (1913), No. 1, pp. 119*).—This report contains statistics showing the acreage devoted to the principal crops and the number of live stock by counties for 1912 and 1913, by minor subdivisions for 1913, and for England and Wales, Great Britain, and the United Kingdom for 1884 to 1913.

The number of holdings by sizes is given for 1913 by counties and minor subdivisions. Between 1895 and 1913 the number of holdings in England and Wales above 1 and not exceeding 5 acres decreased from 97,818 to 92,302; those above 5 and not exceeding 20 acres increased from 126,714 to 122,117; those above 20 and not exceeding 50 acres from 74,846 to 78,027; those above 50 and not exceeding 100 acres from 56,791 to 59,287; those above 100 and not exceeding 200 acres from 68,277 to 69,431; while those above 300 acres decreased from 16,021 to 14,513.

Agricultural statistics of Netherlands (*Jaarc. Konink, Nederlanden, Rijk Europe, 1912, pp. 172–183*).—Contained in this report are statistical data show-

ing for 1910 the subdivision of the total land area according to agricultural uses and number of exploitations by sizes and by types of tenure. The area and production of the principal farm crops are shown for 1898–1912 and the number of live stock for 1891–1910.

World production of cereals in 1913 (*Pub. Min. Roy. Hongrois Agr., No. 2 (1914), pp. 318*).—This publication gives the area, production, and imports and exports of cereals for practically all the countries of the world. For many countries the same information is given for other agricultural products.

Statistics of consumption of cotton, A. SCHMIDT (*Internat. Fed. Master Cotton Spinners' and Manfrs. Assocs. [Pub.], 1913, pp. 23*).—Contained in this report are statistical data showing the consumption of cotton in all countries of the world and the stocks on hand August 31, 1906 to 1913. The number of cotton spinning spindles and the visible supply are also given for 1913.

AGRICULTURAL EDUCATION.

Proposals to bring about a uniformity in the methods of instruction in the lower agricultural schools with special reference to schools for vine growers, M. ARTHOLD (*Land u. Forstw. Unterrichts Ztg., 27 (1913), No. 3–4, pp. 182–189*).—The functions of the various categories of agricultural schools for the training of farmers' sons are discussed. In the author's opinion it would be more feasible to improve existing schools than to replace them by new organizations. Their apparent inadequacy in some respects can be traced largely to the small attendance of many of the schools, which, however, is not the fault of the school system but due rather to other circumstances such as a lack of knowledge on the part of the people concerning the functions of the schools and the value of technical training, unsatisfactory labor relations, etc. The best remedy suggested for this is an untiring itinerant instruction and an active contact with the rural population. The author suggests that the utility of a school does not depend entirely on its organization but also on its management, and points out the desirability of the performance of practical work by students, of examinations to control their progress, and of the supervision of the instructors by the director or an inspector.

[Reports of German horticultural institutions for 1912] (*Landw. Jahrb., 45 (1913), Ergänzungsb. 1, pp. 147+235+158, pl. 1, figs. 111*).—This number consists of the annual reports for 1912 of the royal horticultural institutions at Dahlem, Geisenheim, and Proskau.

The rural agricultural and housekeeping school at Mährisch-Schönberg, K. KOLB (*Land u. Forstw. Unterrichts Ztg., 27 (1913), No. 3–4, pp. 169–174*).—A description is given of the buildings, equipment, and 1-year course of instruction of this school which was opened October 1, 1913, in connection with the Farm and Flax Preparation School.

[Agricultural and forestry instruction in Austria and other countries] (*Land u. Forstw. Unterrichts Ztg., 27 (1913), No. 3–4, pp. V+169–308, figs. 4*).—This number contains special articles noted elsewhere, an account of the Second International Congress of Home Training at Ghent (see p. 393), and a review of agricultural literature and of the activities of agricultural and forestry education institutions in Austria in 1912–13, as summarized from their annual reports.

Some agricultural education institutions in Hungary and the Balkan States, L. MERKOS (*Land u. Forstw. Unterrichts Ztg., 27 (1913), No. 3–4, pp. 222–237*).—An account is given of the organization, equipment, curriculum, and work of the following institutions visited by the author: Royal Hungarian Cellarers' School at Budafok, near Budapest; Royal Hungarian Ampelograph-

ical Institute, at Budapest; Horticultural and Viticultural School, Bukovo, near Negotin, Servia; Horticultural and Viticultural School at Plevna, Bulgaria; Intermediate Agricultural School, Obrassof-Tschiflick, near Rustchuk, Bulgaria; Chemical Agricultural Experiment and Seed Control Station, Bucharest, Roumania; Agricultural High School, Herastrau, near Bucharest; and Farm Horticultural and Viticultural School, Mediasch, Hungary.

Reforms in agricultural education in the Kingdom of Servia (*Land u. Forstw. Unterrichts Ztg., 27 (1913), No. 3–4, pp. 238, 239*).—This is a summary of proposed reforms in agricultural education in Servia, including the introduction of agricultural instruction into normal schools, teacher training institutes, and theological seminaries, to be obligatory in the first-named, the establishment of 17 lower agricultural schools in place of existing agricultural stations, the establishment of a higher agricultural school, and the appointment of 79 itinerant agricultural instructors and 5 agricultural inspectors.

The Woodlawn school garden, Alice V. Joyce (*Nature-Study Rev., 10 (1914), No. 2, pp. 61–65, figs. 3*).—The garden work of the Woodlawn school is described by grades. Each teacher is given a section in which each of her pupils has an individual plat. The last year there were 585 individual plats, those for the primary grades being 5 by 8 ft. and those for the intermediate and grammar grades 8 by 10 ft.

Lebanon County boys' agricultural and girls' domestic science clubs, J. W. Snoke (*Lebanon Co. [Penn.] Boys' Agr. and Girls' Dom. Sci. Clubs Circ. 2 (1914), pp. 16*).—The objects and plans of work of these clubs in corn and potato growing, fruit canning, bread making, sewing, and vegetable growing contests and the exhibition of products are outlined.

Industrial clubs and contests for Oregon boys and girls (*Oreg. Agr. Col. Buls., 1914, Nos. 97, pp. 12; 98, pp. 16; 109, pp. 8, figs. 13; 110, pp. 4, figs. 5; 113, pp. 11, figs. 5*).—These bulletins describe respectively (1) the organization of junior club work, by F. L. Griffin, (2) rules governing each of the 10 approved projects for 1914, by F. L. Griffin, (3) directions for making the Babcock test and keeping the records, by W. A. Barr, (4) a suggested list of tools and materials for the manual arts contest, by H. C. Brandon, and (5) hotbeds and cold frames for the gardener in the vegetable gardening contests.

The country home (*Proc. Conf. Ed. South, 16 (1913), pp. 66, 85–96*).—Problems of the country home were discussed as a part of the 1913 conference on the education of women in the country. The papers presented included How to Relieve the Drudgery of Women on the Farm, by J. Cook; Home Economics and Help for the Home Maker, by B. R. Andrews; Home Economics, or Help for the Home Manager—What Domestic Science is Aiming to Accomplish by Developing Instruction as to Food, Clothing, Shelter, and Home Management, by Isabel E. Lord; The Department of Agriculture and Its Work for the Home, by C. F. Langworthy; Social Life in the Country for Women, by Mrs. M. C. Roark; and The Awakening of Farm Women, by Mrs. W. N. Hutt.

The Second International Congress of Home Training at Ghent, Ida Schuppli (*Land u. Forstw. Unterrichts Ztg., 27 (1913), No. 3–4, pp. 211–221*).—An account is given of the proceedings and resolutions of the sections of the congress with reference to the following topics: (1) Home economics instruction in the elementary school or in connection with it in cities, industrial centers, and rural communities; (2) home economics instruction for adults or in connection with the intermediate school; (3) the training of teachers of home economics; and (4) literature, progress made since the Freiburg congress, and the importance of instruction in home economics in its social relations.

Lesson exercises, C. A. STEBBINS (*Univ. Cal. Syllabus Ser., No. 34 (1912), pp. 32, figs. 33*).—Twenty-one lessons on the soil and its origin, water and soil, the seed and its needs, propagation of plants, roots, stems, leaves, flowers, fertilizers, weeds, insects, birds, plant diseases, and trees, are outlined.

Field trips in elementary agriculture (*W. Va. School Agr., 4 (1913), No. 1, pp. 19, figs. 10*).—As a means of securing correlation between the schoolroom and the community, outlines for four field trips are presented for the purpose of studying soil formation, forest trees, and insects. Directions for preserving weed specimens and mounting twigs and insects are included.

Collection and preservation of plant material for use in the study of agriculture, H. B. DERR and C. H. LANE (*U. S. Dept. Agr., Farmers' Bul. 586, pp. 24, figs. 16*).—Methods of collecting, preparing, mounting, and preserving plant specimens of various sorts are suggested for the use of teachers of agriculture.

Outline of work in agriculture, domestic science, and manual training (*Cicero, Ind., 1913, pp. 19, figs. 4*).—This is an outline of instruction in agriculture in the high schools of Jackson township, Hamilton County, Ind., and in domestic science and art, manual training as related to the farm, and mechanical drawing in grades five to eight, inclusive, and the high schools.

[Reading courses in agriculture and home economics] (*Cornell Reading Courses, 2 (1913), Nos. 39, pp. 153–184, figs. 16; 41, pp. 185–196; 43, pp. 197–208, figs. 6; 45, pp. 209–218; 47, pp. 221–228, figs. 4; 3 (1913), Nos. 49, pp. 47, figs. 27; 51, pp. 49–72, figs. 28; 54, pp. 45–64, figs. 11; 55, pp. 85–103, figs. 10; 56, pp. 65–95, figs. 15; 58, pp. 97–116, figs. 19*).—These numbers treat of the following subjects: The Farmhouse, by Helen B. Young; Rules for Planning the Family Dietary, by Flora Rose; The Box Luncheon, by Clara W. Browning; Hints on Choosing Textiles, by Bertha E. Titsworth; A Canning Business for the Farm Home, by Claribel Nye and Bessie Earll Austin; Household Insects and Methods of Control, by G. W. Herrick; A Story of Certain Table Furnishings, by Clara W. Browning and Edith J. Munsell; The Dairy Herd, by H. H. Wing; Rice and Rice Cookery, by Miriam Birdseye; Practical Horse-Breeding, by M. W. Harper; and Planting the Home Vegetable Garden, by A. E. Wilkinson.

Seasonable suggestions, S. A. MINEAR (*Rural Educator, 3 (1914), No. 3, pp. 48, 49*).—Directions are given for testing seed corn and making a school garden.

Testing seed corn, A. L. SMITH (*Iowa Agr., 14 (1914), No. 7, pp. 363, 364, fig. 1*).—Directions are given for three lessons in testing seed corn, viz, making the testing box, filling the box, and reading the test.

Testing seed corn in rural schools, AUGUSTA D. EVANS (*Ill. Agr., 18 (1914), No. 6, pp. 343–346, figs. 2*).—The author points out the value of seed corn testing and gives directions for making a germination box, preparing the corn for the tester, reading and recording the test, and making a record blank for community testing.

Modern fruit growing, W. WILDEN (*Neuzeitlicher Obstbau, M[ünchen] Gladbach, Germany [1913], pp. 96, figs. 24*).—This is a text and reference book in modern fruit growing for self-instruction and use in seminaries and agricultural schools.

A field lesson on the fuel woods of the farm, J. G. NEEDHAM (*Nature-Study Rev., 9 (1913), No. 9, pp. 282–290, figs. 5*).—A consideration of the fuel value of different kinds of woods is followed by an outline for the study of the fuel woods of the farm in which fuel stuffs are gathered from the woodlot and tested in fire making.

The question of the introduction of instruction in fire extinguishing in the lower agricultural schools (*Land u. Forstw. Unterrichts Ztg., 27 (1913),*

No. 3–4, pp. 206–210).—The author suggests a plan for the introduction of of instruction in fire extinguishing into the lower agricultural schools of Austria and outlines a course in this subject.

Expedients in giving instruction in plant protection, G. KÖCK (*Land u. Forstw. Unterrichts Ztg., 27 (1913), No. 3–4, pp. 175–181, figs. 4*).—In this discussion of the use of illustrative material in instruction in modern plant protection, the author points out the requisites of an efficient wall chart, and describes and illustrates a phytopathological chart showing the injuries by the grape leaf roller (*Cochylis ambiguella*) and methods of combating it, issued by L. Fulmek. Attention is called to the importance of the use of the sciopticon and of biological exhibits illustrating the progress of diseases or injury and of different stages of development of the pest. Seventeen cases of such exhibits have been prepared in recent years by K. Kafka of the Biological Institute of Vienna.

High school entomology (*Agr. Student, 20 (1914), No. 7, pp. 529–531, figs. 2*).—The author calls attention to the economic importance of insects to the farmer, gives directions for making collections, and recommends classifying and studying the insects not according to scientific orders but according to their characteristics, such as parasitic, predacious, beneficial, injurious, herbivorous, etc.

Exercises in farm dairying, C. LARSEN (*New York, [1913], pp. [75], fig. 1*).—This is an elementary loose leaf field and laboratory manual for agricultural high schools and colleges and a practical guide for farmers and dairymen.

Educational school gardening and handwork, G. W. S. BREWER (*Cambridge, England, 1913, pp. XI+192, figs. 71*).—The author considers the aims and ideas that should underlie school gardening, and outlines a method of teaching the subject by which the pupil takes up the suggestions of the teacher, but develops ideas, discovers facts, and forms judgments for himself. The object of the author seems to be the promotion of character building by training boys in habits of industry, cooperation, and broad scientific outlook. Directions are given for making school gardens; correlating the work with drawing, composition, nature study, cookery, arithmetic, and wood and metal work; keeping records; making a school museum; experimental work in the garden; beautifying school buildings and grounds; caring for tools; preparing exhibits; and teaching gardening in evening continuation schools. Lists of suggestive questions and helpful books are added.

Suggestions for teaching nature study, M. J. ABBEY (*W. Va. School Agr., 4 (1913), No. 11, pp. 32, figs. 7*).—These suggestions are intended as a guide to the selection of subject matter and methods of presenting it. Type lessons on a study of the cow, the weather, preparation of nature for winter, clothing, the heavens, insects, and fur bearing animals are included.

Nature study in secondary schools, C. DRIEBERG (*Trop. Agr. [Ceylon], 42 (1914), No. 1, pp. 79–82*).—The author discusses the objects of nature study, the style of teaching it, the object of the school garden as a field for nature study, and the range of general knowledge it is best to gain by nature study in association with the school garden. He recommends that a syllabus dealing with the facts and phenomena of common experience, adapted to the seasons and conforming to local conditions for a junior as well as a senior course of nature study, be prepared for the use of teachers, and that pupils complete this course at about the age of 12 years, go on to a 3-year course of experimental science proper in chemistry, physics, and biology, and then specialize in any one or two branches of science according to the future career decided upon.

Arbor and Bird Day manual for use in West Virginia public schools (*W. Va. School Agr., 4 (1914), No. 3, pp. 58, figs. 28*).—Programs, lessons, and

general suggestions are given for the observation of Arbor and Bird Day on April 3, 1914, in the West Virginia schools.

Planning and adorning the farmstead and school grounds (*Columbus, Ohio: Supt. Pub. Instr., 1913, pp. 36, figs. 13*).—This bulletin, which is intended for seventh and eighth grade and high school pupils of all village and rural schools of Ohio and persons interested in farm and school improvements, offers suggestions for planning and adorning school grounds, homes, and farms.

Back to the farm, M. H. SHUMWAY (*Bul. Univ. Minn., Gen. Ser., No. 12 (1914), pp. 45, figs. 8*).—This play in three acts is intended to illustrate the value of a collegiate agricultural education to the farmer.

MISCELLANEOUS.

Yearbook of the Department of Agriculture, 1913 (*U. S. Dept. Agr. Yearbook 1913, pp. 541, pls. 54, figs. 21*).—This contains the report of the Secretary of Agriculture, previously noted (E. S. R., 31, p. 195); 14 special articles abstracted elsewhere in this issue; and an appendix combining a directory of the agricultural colleges and experiment stations and the state officials in charge of agricultural work, and statistics of the principal crops, farm animals and their products, the federal meat inspection, prices of meat in the United States and Europe, legal standards for dairy products, agricultural statistics from the census of 1910, imports and exports of agricultural products, and imports of pure-bred animals.

Thirty-seventh Annual Report of Connecticut State Station, 1913 (*Connecticut State Sta. Rpt. 1913, pp. XVIII*).—This contains the organization list, a report of the board of control, a financial statement for the fiscal year ended September 30, 1913, and a list of corrections to the report.

Twenty-sixth Annual Report of Illinois Station, 1913 (*Illinois Sta. Rpt. 1913, pp. 12*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1913, brief notes as to additional equipment, and a list of the publications issued during the year.

Twenty-fourth Annual Report of Kentucky Station, 1911 (*Kentucky Sta. Rpt. 1911, pp. XVIII+355, pls. 2, figs. 4*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1911, a report of the director on the work of the station during the year, reprints of Bulletins 153–158, previously noted, and reports of analyses of mineral waters and meteorological data, abstracted elsewhere in this issue.

Biennial Report of the Director of the Kentucky Station, 1911–1913, J. H. KASTLE (*Kentucky Sta., Bien. Rpt. Dir., 1911–1913, pp. 57, pl. 1, figs. 7*).—This contains the organization list, a list of publications, and a review of the work of the station for the biennium ended June 30, 1913.

Report of the director for the year ending June 30, 1913, F. B. MUMFORD (*Missouri Sta. Bul. 117 (1914), pp. 401–443*).—This contains the organization list, a report of the director on the work and publications of the Missouri Station, including reports of heads of departments, the experimental features of which are for the most part abstracted elsewhere in this issue, and a financial statement for the fiscal year ended June 30, 1913.

Health laws, F. G. CAFFEY (*U. S. Dept. Agr. Yearbook 1913, pp. 125–134*).—This article briefly describes the Food and Drugs Act, Meat Inspection Act, and other health laws administered by the Department, and discusses the need for the exercise of powers by the States.

NOTES.

Arizona University and Station.—Ground was broken July 31 for the new agricultural building which is to cost about $165,000. The structure will include office and laboratory room for all departments of the station work, for college class work in agriculture, and for extension work. By an ingenious utilization of the patio, or inner court, of the building, audience room is provided for about 1,600 people. It is expected that the building will be completed in July, 1915.

A new farm of 160 acres has been purchased for the station in Salt River Valley at a cost of $30,000. This farm is expected to afford suitable facilities for experimental work in this representative irrigated district.

Recent appointments include G. W. Barnes as farm adviser in the extension service; W. S. Cunningham, assistant in animal husbandry and dairying at the New Mexico Station, as assistant animal husbandman in the college and station; and Stephen B. Johnson as assistant horticulturist in the college and station.

California University and Station.—A. V. Stubenrauch, in charge of the horticultural and pomological investigations of this Department, has been appointed head of the new division of pomology.

Connecticut College.—A Country Life Conference was held for 3 weeks beginning July 13. The first week was devoted to rural leadership, with conferences of rural ministers, business men, and others. Subsequently, meetings were held by the State Forestry Association, Botanical Club, Pomological Society, Vegetable Growers' Association, Bee Keepers' Association, Farm Managers' and Sheep Breeders' Associations, Dairymen's Association, and Poultry Association.

Connecticut State Station.—H. F. Huber, a graduate of the New Jersey College, has been appointed specialist in market gardening.

Georgia Station.—The legislature recently appropriated $2,500 to be used for buildings and repairs. This action is encouraging as it is the first money appropriated for the station by the State for over 20 years.

Iowa College and Station.—A plant industry building of the same general type of architecture as the hall of agriculture is under construction. One of its wings is to be a plant laboratory for work in truck crops, floriculture, landscape gardening, and general horticulture. This laboratory is to consist of a cellar containing a cold-storage room for cut flowers, truck crops, and pomology, and rooms for the storage of greenhouse supplies, bulbs, roots, etc.; a basement with three plant propagation laboratories and a packing and shipping room; a main floor with offices, a large truck-crop laboratory and smaller recitation rooms, etc.; and a first floor with offices for the station staff in truck crops and pomology, drafting rooms, and a research laboratory. This laboratory building is expected to be ready for occupancy at the beginning of the second semester.

Immediately adjoining it is being built a range of greenhouses, covering about one-half acre. Eventually there will be ten of these houses, six being 25 by 75 feet, three 25 by 150 feet, and one 25 by 150 feet with a palm house 50 by 30 feet. Eight of these houses are already nearly completed.

Harlan B. Munger, assistant in farm cost accounting in the farm management investigations of this Department, has been appointed professor of farm management in the college and chief in farm management in the station.

Kansas College.—Rev. Walter Burr, of Louisville, Kans., has been appointed director of the rural service department in the extension division beginning about August 1. Otis Earle Hall, a graduate of Wabash College and for the past 8 years a county superintendent of schools in Indiana, has been appointed supervisor of boys' and girls' club work beginning September 1.

Kentucky University.—A demonstration of machinery suitable for preparing agricultural lime was held during the week of June 22, with addresses on soil fertility and the use of lime in agriculture.

Massachusetts College.—Prof. George F. Mills has been made dean emeritus and E. M. Lewis dean of the college. R. J. Watts has been appointed secretary. Miss Helena T. Goessmann has been appointed instructor in languages and literature and will offer a course on rural literature which, it is believed, is not given elsewhere.

Minnesota University and Station.—A week's conference of teachers of agriculture and home economics was held June 20–25, with special instruction by members of the college faculty during the morning and conferences regarding work in the high schools in the afternoon. The first Country Life Conference to be held in the State took place the following week, with special attention to the problems of rural ministers, social workers, and others interested in rural social welfare.

W. F. Lusk has been appointed assistant professor of agricultural engineering beginning August 1. Dr. Howard C. Kernkamp assistant veterinarian in the station, and Mary G. Blythe instructor in clothing in the school of agriculture.

Nebraska University and Station.—R. K. Bliss has resigned as professor of animal husbandry and animal husbandman to become director of the agricultural extension service of the Iowa College.

New Hampshire Station.—J. B. Scherrer has been appointed vegetable gardener.

New Jersey College and Stations.—The new agricultural building has been completed. It will house the departments of botany, plant pathology, soil fertility, extension teaching, horticulture, and seed testing.

The station poultry department has been assigned an area of about 20 acres of land which will be developed for experimental work in poultry husbandry.

A number of research fellowships have been recently established by industrial concerns, among them the Chilean Nitrate Propaganda, and others are anticipated. Thomas A. Edison has also provided an industrial fellowship for the study of ground limestone as a factor in soil improvement. Nicholas Kopeloff and R. C. Cook have been appointed research fellows under two of these grants.

Among other recent appointments are the following: Clarence E. Brett as instructor in poultry husbandry; Frank App, assistant professor of agronomy and assistant agronomist at the New Hampshire College and Station, as assistant professor of agronomy; and Miss M. Anna Houser and C. M. Arthur in charge of extension work in home economics and marketing respectively. Ward C. Pelton, in charge of extension work in market gardening, has resigned

to accept a position at the Delaware College and Station. Arthur J. Farley has been transferred from extension work to an instructorship in horticulture, Warren W. Oley from research to extension work in the same subject, and Alexis L. Clark from extension work to become an assistant state leader in extension work.

Cornell University.—The equipment of the college of agriculture is being augmented by the addition of new buildings for work in soils and animal husbandry, which are approaching completion. The soils building, for which $100,000 was available, will house the teaching and investigational activities of the department of soil technology. The animal husbandry building provides about 37 rooms for the department of animal husbandry and costs about $91,000. In connection with this building is a large stock-judging pavilion 160 by 80 feet, accommodating about 500 people.

The summer school of agriculture secured an enrollment of about 360. Several new courses were offered for the special benefit of those teaching agriculture.

The department of home economics is cooperating with various communities in organizing local canning clubs among farm women. These clubs aim to promote a knowledge of the possibilities of canning as a profitable addition to the activities of the farm.

Ohio State University.—The former department of agronomy has been divided by the establishment of a department of agricultural engineering, with H. C. Ramsower in charge and F. W. Ives as instructor. A. G. McCall has been granted a year's leave of absence, during which time George Livingston will be acting head of the department of agronomy, with instruction work in charge of Forrest Semple. M. F. Abel has been appointed graduate assistant in field crops.

Recent promotions include Dr. J. F. Lyman, D. J. Kays, and Vernon H. Davis as professors of agricultural chemistry, animal husbandry, and horticulture respectively. L. M. Montgomery has been made professor of horticulture, and Miss Minna C. Denton professor of home economics. J. R. Wiley and Gilbert Gusler of the department of animal husbandry, W. G. Stover of the department of botany, and R. B. Stoltz and W. L. Clevenger of the dairy department, have been appointed assistant professors. A professorship of farm management in the rural economics department has been established.

C. S. Wheeler has been appointed in charge of agricultural extension work in public schools, vice A. B. Graham resigned to become head of the newly established New York State School of Agriculture on Long Island.

The first Country Life Week was held beginning August 10, with special attention to the needs of rural ministers.

Oregon College and Station.—Recent important additions have been made to the dairy and live stock herds with a view to strengthening both the instruction and experimental work of these departments. It is announced that a pure-bred herd of the four principal dairy breeds is to be built up as rapidly as possible.

Extension work in dairying has been separated from that in live stock and remains under the direct charge of E. B. Fitts. Ralph McBurney, instructor in chemistry in the Oklahoma Station, has been appointed instructor in bacteriology, and Leroy Childs research assistant in entomology.

Pennsylvania College and Station.—H. P. Davis, instructor in dairy husbandry and assistant experimentalist, has resigned to accept a position with the Dairy Division of this Department.

West Virginia University.—President Thomas E. Hodges resigned August 1 to become a candidate for Congressman at Large. Dr. Frank B. Trotter, dean of the college of arts, has been appointed acting president.

G. L. Oliver has been appointed extension instructor in dairying in cooperation with the Dairy Division of this Department. C. L. Hartley has been appointed assistant to the director in agricultural extension.

Agricultural Grants of the General Education Board.—*The Journal of Education* announces that at the spring meeting of the board appropriations aggregating $1,400,000 were allotted. Among the items were $36,500 for the maintenance of rural school supervision in the Southern States, $20,000 for farm demonstration work in six counties in Maine, $10,000 for similar work in New Hampshire, and $50,000 for rural school agents to work in connection with state departments of education in 15 States.

Spanish Railways and Agriculture.—A Spanish railway in the Province of Soria, to improve agricultural conditions, has provided its stations with small agricultural museums supplied with various kinds of useful information, such as formulas for fertilizers and their use, methods of buying fertilizing material, addresses of houses selling machinery, seeds, plants, live stock, etc., directions for organizing agricultural societies, the manner of soliciting appropriations from the central government, construction of district roads, and details of different industries which might be introduced with success in the province. Experiment fields showing how to use fertilizers have been established near the different stations by the Central Experiment Station Service of Madrid, and lectures given on their proper use. Demonstrations of agricultural machinery have been made by local agents of manufacturers. As a result Soria has been making noteworthy progress in agriculture.

Agricultural Education in India.—The American Presbyterian Mission is acquiring 53 acres near Allahabad to establish a fully equipped agricultural department for experimental work in connection with the Ewing Christian College at Allahabad. It will be in charge of Samuel Higginbottom, an American missionary, who has already introduced numerous important improvements in agricultural methods among native farmers near Allahabad.

Miscellaneous.—Peter Waite, of Adelaide, has given to the University of Adelaide his house and grounds at Urrbrae, embracing an area of 134 acres, half of the land to be available for the university for agricultural and kindred subjects and the balance as a public park under its control. He has also given to the government of South Australia 114 acres adjoining Urrbrae for the establishment of an agricultural high school.

Officers in the department of rural and agricultural education of the National Education Association were chosen at the St. Paul meeting July 4–11 as follows: President, E. C. Bishop, of the Iowa College; vice president, M. J. Abbey, of the West Virginia University; and secretary, F. L. Griffin, of the Oregon College.

The Italian minister of agriculture has recently authorized the transformation of the Royal School of Agriculture, at S. Ilario Ligure, into a colonial agricultural school with a 3-year course for the training of students in practical farming in the Italian colonies.

Leonard S. Klinck, professor of cereal husbandry at MacDonald College, has been appointed dean of the College of Agriculture of the British Columbia University, now in process of establishment.

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EXPERIMENT STATION RECORD.

Editor: E. W. ALLEN, PH. D., *Assistant Director.*
Assistant Editor: H. L. KNIGHT.

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Stations in the United States.

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U. S. Department of Agriculture.

[a] The popular bulletin entitled Sheep for Washington Farmers, issued September 13, 1913, and abstracted (E. S. R., 29, p. 870) as Popular Bulletin 57, is evidently now regarded as Popular Bulletin 58.

EXPERIMENT STATION RECORD.

VOL. XXXI. OCTOBER, 1914. No. 5.

One of the most striking educational developments of recent years has been the increasing interest manifested in the subject of vocational training. Less than a decade ago the term itself was unfamiliar to the general public. To-day we find the desirability of such instruction comparatively well recognized, promising beginnings toward its development in some form already under way in every State of the Union, and an ever deepening realization of its importance to the nation as a whole. Similar conditions have come about in the Dominion of Canada, and in both countries commissions have been appointed to collect information regarding the status of vocational training and to present recommendations for its further development in a comprehensive way. The reports of these commissions have recently become available and bring together a large amount of useful data along these lines. In each case due attention has been accorded to those phases pertaining to training in the trades and industries and to commercial education, but much prominence has also been given to the question of education for farm life and homemaking, and the findings of the commissions regarding this subject are of much interest.

The Canadian commission, known as the Commission on Industrial Training and Technical Education, was appointed in 1910 by the Dominion authorities following a memorandum from the Minister of Labor. Its purpose was to inquire into the needs and present equipment of the Dominion "representing industrial training and technical education and into the systems and methods of technical instruction obtaining in other countries." Dr. James W. Robertson, principal of MacDonald College and well-known for his deep interest in agricultural education, was made chairman of the commission. A thorough study of these questions followed, embracing conditions not only in Canada but also in the United States, Great Britain, Ireland, Denmark, France, Germany, and Switzerland, and extending over several years. The report, submitted for publication in 1913, constitutes four volumes of nearly 2,500 pages, one volume containing a summary of the commission's findings and recommendations, another

quite detailed accounts of the status of vocational education in Canada, and the others similar data pertaining to the remaining countries.

The United States commission was appointed by President Wilson in response to a joint resolution of Congress authorizing a commission of nine to consider the subject of national aid for vocational education. Its personnel consisted of the following: Senators Hoke Smith, of Georgia, and Carroll S. Page, of Vermont; Representatives D. M. Hughes, of Georgia, and S. D. Fess, of Ohio; John A. Lapp, director of the Indiana Bureau of Legislative Information and secretary of the Indiana Commission on Industrial Education in 1912; Miss Florence M. Marshall, director of the Manhattan Trade School for Girls of New York City; Miss Agnes Nestor, of Chicago, president of the International Glove Workers' Union; Charles A. Prosser, secretary of the National Society for the Promotion of Industrial Education; and Charles H. Winslow, of the United States Bureau of Labor Statistics and a member of the Massachusetts Commission on Industrial Education, 1906–1909. This commission organized as the Commission on National Aid to Vocational Education on April 2, 1914, by the election of Senator Smith as chairman, and Ernest A. Wreidt, director of the Public Education Association of New York City, was subsequently appointed secretary.

Inasmuch as the law establishing the commission required it to submit its report not later than June 1, a period of less than two months was available. This time, however, was utilized as fully as possible in meetings of the commission and subcommittees, hearings given to representatives of the Federal Departments and national organizations interested as well as to individuals, questionnaires sent out to superintendents of public instruction, national labor organizations, and others, and the preparation of a bibliography of the subject. A considerable amount of useful data was thereby accumulated, and the two-volume report covers about 500 pages. Much of the time and attention of the commission were necessarily devoted to the specific question of national grants to the States for vocational education and to the drafting of a bill embodying these recommendations, but much information is also contained in the report as to the general subject of secondary agricultural education.

The reports of the two commissions are in most significant agreement as regards the need of developing the vocational aspects of agricultural education at this time. Thus from the economic side, the Federal Commission points out that "a virgin fertility of soil is no longer available for unintelligent exploitation over any considerable area in the United States, and in the future a permanent and increasingly productive and profitable agriculture can be achieved throughout the country only by scientific culture. In agriculture, science has advanced far beyond practice, and it has become essential

for the welfare of our increasing population that the farmer be made an expert." Furthermore, "history records the decline of nations which have failed to maintain their soil fertility, and history will certainly repeat itself in the United States unless we, and not posterity, succeed in inaugurating now a system of agricultural training that is nation wide, which shall achieve a permanent and highly productive agriculture." Similarly the Canadian commission maintains that "it is high time for Canada to recognize the difference between the primitive conditions of the undeveloped country and the complexities of advanced rural life in a democratic civilization," and that "the conservation of a vigorous, intelligent, and prosperous population in the country stands out among the foremost duties of the whole nation. . . . Acceptable instruction, adequate education, capable leadership, and hearty cooperation are necessary means."

Likewise the tendency to rural depopulation is recognized as a serious menace in both countries. Statistics are given showing that in Canada, despite the opening up for settlement of vast areas of virgin land in the western provinces, the rural population of the Dominion increased from 1901 to 1911 but twenty per cent, while the urban population showed a gain of sixty-two per cent. The commission concludes that "nothing can be done by legislation to compel people to stay in the country, but much may be done by education to cause them to prefer to stay there." Moreover, "whether the movement of population at present flowing from rural to urban areas goes on or takes an opposite direction, the rural communities for their own sakes are entitled to and must have education suited to the needs of all their members."

One of the questionnaires propounded by the United States commission and sent out to superintendents of schools in typical rural counties indicated that the popular belief that boys and girls are being drawn from the farms to the cities is generally well founded. Two of the principal explanations advanced were the supposed lack of profit in farming and the absence of suitable education. Of two hundred and fifty-three suggestions of means tending to retain the boys on the farm, eighty-five mentioned the development of demonstration work, seventy-eight the improvement and multiplication of agricultural schools, and thirty-nine the provision of better teachers of agriculture, while in a similar query as to girls, over one-third advocated the provision in high or normal schools of agricultural and home economics instruction. These replies were admittedly few in number, but they may perhaps be interpreted as none the less typical of the increasing belief in the need and efficacy of secondary instruction along these lines.

As would be expected, the details of the plans recommended by the two commissions for a system of secondary agricultural education

vary considerably. The Canadian commission, whose scope, it should be stated, was somewhat wider than that of the United States commission, since it embraced industrial and technical education of the higher and lower as well as the secondary grades, suggests a comprehensive system of agricultural training. This system has as its base, intermediate rural classes or schools for pupils thirteen years of age or over. These institutions would offer two-year courses at the schools, on the farm, and in the home, and would aim to prepare pupils for general farming, housekeeping, and life in a rural community. They would also admit graduates to the rural high schools. These high schools would present a four-year course, the first two years of which would be similar to those of the rural intermediate school, and as a whole would aim to prepare students for rural occupations and housekeeping as well as for admission to the agricultural colleges. There are also recommended resident or traveling county instructors in farming and housekeeping, who would eventually be associated with the rural schools or high schools and in some cases with a system of demonstration farms. Special types of schools, such as apprentice schools for the teaching of ordinary farm practices, short courses to be offered at the demonstration farms, and resident county agricultural and housekeeping schools for young people from seventeen years of age upwards are also suggested to meet certain conditions.

The United States commission recognizes the provisions now being made under the Smith-Lever Act for the education of the adult farmer and his wife, but suggests the need of additional provision for the boys and girls of the rising generation. It believes that "the most opportune time to train the boy is during his adolescent period, when he has already gained much knowledge of farm work and its requirements and is at the age when he is most ambitious, most alert, and therefore most teachable. The agricultural school will awaken interest, turn his attention to the large possibilities of a scientific and businesslike agriculture, and give him an elementary knowledge of right methods of farming which will start him in his career as a farmer and prepare him to use with profit the scientific and practical information which magazines, bulletins, and farm-extension teaching are bringing to his door."

To this end it advocates a system of schools of subcollegiate grade and for pupils over fourteen years of age. The instruction recommended is classified in general as that of all-day schools but with ample provision for correlating the school work with farm operations. Much insistence is placed upon directed or supervised farm practice to be obtained either on the home farm or a farm provided by the school. As regards details, however, either as to types of schools or methods of operations, the commission recognizes the great

diversity of conditions prevailing in the various States and deems the adoption of any arbitrary and inflexible system both impracticable and undesirable.

In no respect are the two commissions more thoroughly in accord than in their realization of the scarcity of well-trained instructors and of the fundamental necessity for providing means for their more adequate preparation. Thus, the United States commission believes that "the development of vocational education along right lines both for agriculture and for the trades and industries will depend largely upon the ability to secure and retain well-trained teachers." The dearth of such teachers and facilities for training them was emphasized by most of those testifying at the various hearings. The commission states that "excellent as has been the technical preparation which the state colleges of agriculture and mechanic arts have given to their students, many of them have not as yet developed departments of education adequate to the task of training prospective teachers either of agriculture or the mechanic arts in the administrative and teaching problems of the vocational school," and it draws attention to the fact that although under the Nelson amendment over $1,300,000 was provided for the fiscal year ended June 30, 1913, from which an indefinite portion could be expended for the preparation of teachers, but $34,000 was actually utilized for this purpose. "We can not rightly undertake a program of practical education in this country and carry it through successfully without teachers properly qualified by training and experience for their work and with practically no facilities for their proper training in the future."

So, too, the Canadian commission declares that "at the present time the supply of competent men obtainable as instructors in agriculture is entirely inadequate to meet the demand. It is important that thoroughly trained men should be available. Men for this educational work need liberal education and practical experience of work similar to that of the department which they are to direct. Their general education should give them a good grounding in the natural sciences, particularly in their relation to the science and art of agriculture. They should have a good knowledge of technical and practical agricultural and farm practice, and have sound acquaintance with the important questions in economics and sociology, as applicable to rural communities. It is also important that they should have a good knowledge of the art of teaching and the underlying principles of it. It would seem necessary that the district instructor should be a graduate of an agricultural college or have the education of a rural high school and be a graduate of the science department of an arts college. The qualification for a teacher in a

rural high school or a county or district agricultural school should not be less thorough and wide."

As a means of developing better trained instructors, this commission recommends increased efforts on the part of the agricultural colleges in this direction. It maintains that the Canadian agricultural colleges have aimed to educate young men to go back to the farm, whereas those of Europe definitely profess to train young men for professional service in connection with agriculture and rural life. Inasmuch as "the need for capable and thoroughly trained men is already so great that the present capacity of the agricultural colleges would not suffice to meet it for several years to come," it appears to the commission that "the agricultural colleges maintained by public funds should devote themselves chiefly to the education of those who would serve the rural community. Under present conditions it does not seem probable that any large percentage of the working farmers can be spared from their occupations or can have opportunity to take a full course at an agricultural college. The helpfulness of the agricultural college can be carried to every community through the labors, knowledge, and character of men and women who are trained at the college for professional service; and it can best serve the rural population through the education of such men and women." As a means to that end it recommends the development of courses for the preparation of teachers qualified to carry on the science and practical work in connection with the intermediate rural school, rural high schools, and county or district agricultural schools, and of district instructors who in addition to technical and practical instruction in agricultural work would receive training in the art of teaching and in the administration of affairs in rural communities.

The foregoing summary necessarily covers only a portion of the large amount of material embraced in the extended reports of these commissions, but it is thought that it may none the less prove of service in directing attention to these interesting documents. Although some of the conclusions of the commissions may seem already familiar to many educators, and others may be received with some differences of opinion, the reports as a whole are entitled to serious consideration, especially as representing the views of official bodies appointed for the specific purpose of inquiring into this great question of the development of vocational training. They are also of special importance as the practically contemporaneous expressions of national commissions of two countries with much in common in their educational problems, and they should, therefore, be of unique value in aiding in the solution of some of the intricate problems involved in the development of secondary agricultural education.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

A report of chemical investigations on the lime-sulphur spray, H. V. TARTAR (*Oregon Sta. Research Bul. 3 (1914), pp. 28*).—The first investigation reported in this bulletin has been noted previously from another source (E. S. R., 23, p. 701).

The primary action between sulphur and calcium hydroxid was studied because the investigations cited in the literature did not include this phase of the subject and the work in general on this topic was imperfect. In the literature it is shown that the products resulting from the reaction of sulphur with the alkali and alkaline earth hydroxids are polysulphids and thiosulphates, but in practically all of the investigations air was not excluded from contact with the products of the reaction. This caused an error due to the rapid oxidation of the polysulphids. Most of the experiments were also made with an excess of sulphur and probably without considering a possible secondary reaction of the sulphur with the products formed by a primary reaction. Previous work was also handicapped by the lack of methods for determining the amount of the hydroxid of a metal present in solutions also containing polysulphids and thiosulphates of the same metal.

"The primary reaction between calcium hydroxid and sulphur in heated aqueous solution takes place as represented by the following equation:

$$3Ca(OH)_2+10S=2CaS_4+CaS_2O_3+3H_2O."$$

The reaction resembles that occurring with potassium hydroxid and sulphur with the exception that with potassium hydroxid the trisulphid (K_2S_3) is formed. "When sulphur is used in excess, a secondary reaction occurs, in which it combines with the calcium tetrasulphid to form the pentasulphid."

When considering the theoretical basis for the proportion of lime and sulphur used in the preparation of lime-sulphur solution, it is pointed out that although some difference still exists in the recommendations made by the different experiment stations, the more recent work shows the proper proportion of lime and sulphur to be approximately 1:2.

"The compounds formed by the reaction between calcium hydroxid and sulphur, under ordinary commercial conditions of manufacture, are calcium tetrasulphid, pentasulphid, thiosulphate, and sulphite. All of these compounds are readily soluble in water with the exception of the sulphite, which is comparatively insoluble." The chemical analysis of a lime-sulphur solution, therefore, will show the amount of lime and sulphur which have reacted to form the same, with the exception of these substances necessary to form insoluble sulphites. The equation given above "shows that when calcium hydroxid and sulphur combine, one-third of the calcium is combined as thiosulphate and two-thirds as polysulphid. Since there is no decomposition of the polysulphid, the quantitative estimation of the calcium combined in this form gives a means for determining the amount of thiosulphate which has been formed. The difference

between this total estimated amount of thiosulphate and the amount present in the solution, is the quantity that is decomposed; and from this the amount of sulphite can be easily calculated.

"The initial ratio of lime to sulphur is also easily determined when one knows not only the amounts of calcium and sulphur present in a given lime-sulphur solution, but also the insoluble sulphite produced in the preparation of the same. . . . The data given show that the proportion of lime (CaO) to sulphur which reacts in the preparation of the more concentrated commercial lime-sulphur solutions, is but a mere trifle greater than 1:2. . . . More dilute solutions prepared under commercial conditions [were not examined]. It is evident, however, from the work of Thatcher[a] and Van Slyke et al. [E. S. R., 24, p. 663] that the ratio in this case would be somewhat greater than 1:2; in some cases it would be perhaps 1:2.25.

"The theoretical basis given here will not exactly apply to the preparation of small amounts of solution, say 150 gal. or less, where the oxidation of the polysulphids occurs to a considerable extent through contact with the air."

In general, the insecticidal properties of lime-sulphur are due principally to its power to take up large amounts of oxygen, the amount of free sulphur formed in its decomposition, and its ability to soften the newly secreted wax at the margin of scale insects. The question of the correct valuation resolves itself into the quantitative measurement of these factors.

The amount of oxygen consumed depends upon the following reactions: (1) $CaS_5+3O=CaS_2O_3+3S$; (2) $CaS_4+3O=CaS_2O_3+2S$; (3) $CaS_2O_3=CaSO_3+S$; and (4) $CaSO_3+O=CaSO_4$. Calcium sulphite is formed very slowly on account of the slow decomposition of the thiosulphate. The oxygen required to produce sulphate is absorbed slowly, and it has been found that the sulphite has practically no insecticidal value as far as San José scale is concerned. It may, however, be important to use as a measure for insecticidal efficiency the oxygen required to convert the polysulphid, using Harris's method for monosulphid (E. S. R., 25, p. 414) into thiosulphate. It is suggested that the oxygen-consuming power be expressed as the oxygen number, this term to mean the number of grams of oxygen absorbed by 100 gm. of lime-sulphur solution.

Free sulphur is liberated from lime-sulphur according to (1), (2), and (3) of the foregoing equations.

The reduction of polysulphid takes place rapidly and there is a correspondingly rapid deposition of sulphur. The decomposition of thiosulphate is much less rapid. No good evidence, however, exists which shows that the liberated sulphur is not of equal insecticidal value, and the total free sulphur which would be deposited may be expressed as the available sulphur number.

The insecticidal property of softening the so-called wax of scale insects (E. S. R., 26, p. 753) is not easily estimated and the caustic properties of soluble calcium polysulphid are not explained on the basis of the calcium hydroxid present. "Experience in handling the spray simply verifies the correctness of Shafer's statement that the 'so-called caustic action of the wash on the hands seems rather due to its strong reducing power (power to absorb oxygen) than to the alkalinity of the solution.'" It is possible also that the reducing power may also cause the softening of the so-called wax of the scale insects. If this assumption is found to be true the oxygen number mentioned above would be its quantitative measure. "The power of the spray to soften the so-called wax is evidently due to some property of the polysulphids, and in the light of present knowledge no definite statement can be made regarding its exact nature or its exact quantitative analytical measurement."

[a] Jour. Amer. Chem. Soc., 30 (1908), No. 1, pp. 63–68.

On the reaction between sulphur and potassium hydroxid in aqueous solution, H. V. TARTAR (*Jour. Amer. Chem. Soc., 35 (1913), No. 11, pp. 1741–1747*).—This material has been noted in the abstract above.

On the valuation of lime-sulphur as an insecticide, H. V. TARTAR (*Jour. Indus. and Engin. Chem., 6 (1914), No. 4, pp. 313–315*).—This material has been adequately noted in the abstract above.

Soluble arsenic in mixtures of lead arsenate and soap, H. V. TARTAR and L. A. BUNDY (*Jour. Indus. and Engin. Chem., 5 (1913), No. 7, pp. 561, 562*).—"These results show that in the mixtures of the soaps with the acid arsenates large amounts of arsenic are rendered soluble. The results also indicate that when a neutral (ortho) arsenate of lead is used with soap only a very small amount of arsenic is made soluble. Evidently, the use of a mixture of soap with an acid arsenate of lead for spraying purposes would be a dangerous practice, for the amount of soluble arsenic would be sufficient to burn badly the foliage of fruit trees."

The present status of the synthesis of plant alkaloids, H. BAUER (*Der Heutige Stand der Synthese von Pflanzenalkaloiden. Brunswick, 1913, pp. VIII+144*).—This monograph deals with the synthesis of the alkaloids comprising the pyridin, tropin, isoquinolin, and purin groups, the oxyphenylalkylamin bases, and the synthesis of the cleavage products of alkaloids. An extensive bibliography is distributed throughout the work.

Solubility of casein in dilute acids, L. L. VAN SLYKE and O. B. WINTER (*Abs. in Science, n. ser., 38 (1913), No. 983, p. 639*).—"Casein, freshly prepared by precipitating skim milk with acetic acid and washing free from acid, was treated with 100 cc. of different acids of known strength for given periods of time at definite temperatures and the undissolved residue determined. The acids used were hydrochloric, sulphuric, lactic, and acetic; strength of solutions, tenth-normal, 1/100-normal, 1/500-normal; time of contact, 1, 5, and 15 minutes; temperatures, 15°, 25°, and 42°. In general, the amount of dissolved casein increases with increase of temperature, time of contact, and concentration of acid. Hydrochloric acid dissolves most, and then come in order, lactic, sulphuric, and acetic."

A contribution to the history of corn sugar, P. L. DE VILMORIN and F. LEVALLOIS (*Rev. Sci. [Paris], 51 (1913), I, No. 13, pp. 396–401*).—A résumé of the literature on the subject with a report of some experiments by the authors themselves.

Most of Heckel's findings (E. S. R., 29, p. 409) were confirmed. The fact that the sugar develops and decomposes rapidly in the corn stalk is somewhat of a handicap, but the indications are that some means may finally be devised whereby the biological processes going on in the plant may be controlled.

Contribution to our knowledge of the chemistry of gums and mucin substances, W. SCHIRMER (*Arch. Pharm., 250 (1912), No. 3, pp. 230–251; abs. in Chem. Zentbl., 1912, II, No. 3, pp. 195, 196*).—This reports investigations with reference to the gums of *Anogeissus latifolius* and *Odina wodier* and the mucin-like substances of *Sassafras variifolium*, *Althea officinalis*, and *Ulmus fulva*.

In regard to a uniform nomenclature for ferments, J. GIAJI (*Rev. Sci. [Paris], 51 (1913), I, No. 11, pp. 333–335*).—A plea for uniform nomenclature for ferments and some suggestions in this connection.

The existence of three types of proteolytic vegetable ferments in latexes, GERBER (*Compt. Rend. Acad. Sci. [Paris], 157 (1913), No. 3, pp. 241–243*).—The proteolytic enzyms present in latexes from *Ficus carica* and *Broussonctia papyrifera* are of three kinds, rennet (coagulating), casease (digesting), and trypsin. The ferment of *F. carica* will not coagulate nor digest raw milk, casein, and fibrin in the presence of traces of neutral salts of silver, copper,

mercury, gold, platinum, etc., and chlorin, bromin, iodin, and hydrogen peroxid. The enzym from *B. papyrifera*, on the other hand, will coagulate and digest raw milk, casein, and fibrin. It will also act in the presence of traces of the salts of the chemicals mentioned above, even if the doses are comparatively large.

The lipases of a latex, C. GERBER (*Compt. Rend. Soc. Biol. [Paris]*, *74 (1913), No. 12, pp. 718–721*).—The saponification of unboiled egg yolk by the latex of *Euphorbia characias* was only feeble when massive amounts of latex were allowed to act upon egg yolk emulsion. The saponification of boiled egg yolk was much more regular than that of the untreated yolk. This latex was in small quantities and obeyed the law of proportion. The difference between the two types of saponification was the same as exists between the two types of caseation which occur in boiled and unboiled milk.

The rennet of the latex of Calotropis procera, C. GERBER and P. FLOURENS (*Compt. Rend. Acad. Sci. [Paris], 155 (1912), No. 6, pp. 408–410; abs. in Chem. Zentbl., 1912, II, No. 17, p. 1469*).—The milky juice of this plant contains a vegetable proteolytic enzym which coagulates boiled milk with greater ease than raw milk. The enzym is very stabile toward heat. While small amounts of metals belonging to the gold group and mercuric chlorid lessen the coagulating power of the enzym, alkalis seem to increase its fermenting power.

In regard to the nature of amylases, S. KAMECKI (*Abs. in Chem. Ztg., 37 (1913), No. 47, Repert., p. 220*).—The amylases obtained by fractional precipitation of malt extracts have different properties. The first fraction has the greatest starch liquefying power, while the saccharifying power is most intense in the third fraction. In the fourth fraction it is similar to that of the first fraction. Various enzyms seem to take part in the process.

In regard to invertase, I, II, J. MEISENHEIMER, S. GAMBARJAN, and L. SEMPER (*Biochem. Ztschr., 54 (1913), No. 1–2, pp. 108–154*).—In the preparation of invertase by treatment with acids, the material forming the basis of the tests was Buchner's yeast press juice. Dilute acids were found to precipitate much of the proteins contained in the juice without destroying the activity of the invertase. The precipitate obtained with acetone from the juice which had been previously treated with acid was twice as active as a juice treated with acetone alone.

An investigation of the enrichment of the invertase content of living yeasts (pp. 122–154) showed that the invertase content of lager beer yeast can be increased as much as eight times its original amount by simply propagating the yeast in a saccharose solution.

On the preparation of neutral ammonium citrate solution, P. RUDNICK and W. L. LATSHAW (*Jour. Indus. and Engin. Chem., 5 (1913), No. 12, p. 998*).—The method recommended by the committee on ammonium citrate solution of the division of fertilizer chemistry of the American Chemical Society and the method proposed by Patten and Marti (E. S. R., 29, p. 718) were studied comparatively. In the first named method, however, the neutrality was determined by the indicator method of Hand (E. S. R., 23, p. 508).

Two ammonium citrate solutions, one slightly acid and the other alkaline, were tested against the same acid phosphate preparation. The alkaline solution, analyzed by the Patten and Marti method, showed a ratio of ammonia to citric acid of 1 : 3.748, and the acid solution a ratio of 1 : 3.786. "The results indicate that the variation of these solutions from the ratio given by Patten and Marti [1 : 3.765] was not sufficient to affect the results obtained on the sample of acid phosphate in question. Further work on this subject is in progress."

The determination of citric acid-soluble phosphoric acid in Thomas slag powder, F HAUSSDING (*Landw. Jahrb., 45 (1913), No. 1, pp. 119–126*).—This is

a study of the Lorenz method and the Popp iron citrate method (E. S. R., 29, p. 410).

The Lorenz method was studied with chemically pure salts of known phosphoric acid content and later with additions of calcium and iron salts, and silicates, and the results obtained corresponded well with the theoretical figures. With Thomas slag powders it gave figures which were always lower than those obtained by the Official Method (removal of silica by hydrochloric acid). It also presents many difficulties in the way of manipulation.

The Popp method was studied from the standpoint of time required for precipitation (determination made directly after shaking and after 48 hours), the time for filtration (directly after stirring and 24 hours later), and the effect of time of stirring (one-half hour and one-quarter hour). The results obtained were practically the same in all instances.

In a comparison with the Official Method, the Popp method with 23 samples of slag powder gave slightly higher results, and in 17 cases somewhat lower results. On the whole, the figures obtained by the two methods agreed very well, and in only two cases was there a difference of over 0.2 per cent (0.25 to 0.22 per cent) noted. The Popp method always gave higher results than the Lorenz method, the average results being 16.201 and 15.905 per cent of phosphoric acid, respectively.

Winkler's method for the determination of oxygen in water; the effect of nitrite and its prevention. F. E. Hale and T. W. Melia (*Jour. Indus. and Engin. Chem., 5 (1913), No. 12, pp. 976–980*).—Considerable criticism has arisen of late regarding the effect of nitrites upon the results obtained by the Winkler method. The present experiments were undertaken for the purpose of ascertaining the extent of error with varying amounts of nitrite and to find, if possible, a simple method for preventing the error.

The results show that when nitrites are present in quantities below 0.2 part per million in ordinary tap water, the figures obtained for dissolved oxygen are fairly accurate. Winkler showed the danger point to be with 0.1 part per million or over.

"The effect of high nitrite present in any amount ever occurring in water may be counteracted by the use of potassium acetate solution (or sodium acetate crystals) to neutralize the hydrochloric acid before exposure to the air. The procedure then is to add at the bottom of the bottle 2 cc. of manganous sulphate solution (480 gm. per liter) followed by 2 cc. of potassium hydroxid-iodid solution (360 gm. hydroxid and 100 gm. iodid per liter). Shake and settle. Add at the bottom 2 cc. concentrated hydrochloric acid and shake until the precipitate is entirely dissolved. Then add 2 cc. potassium acetate solution (1,000 gm. per liter) at the bottom and mix. Withdraw by pipette 100 cc. into an Erlenmeyer flask and titrate with 1/100-normal thiosulphate, adding a little starch solution at the end. Correction must be made for 6 cc. of water displaced by the first two solutions and by the acetate solution. The acid needs no correction, since it displaces only water from which oxygen has been removed.

"Precautions must be taken (1) to exclude contact with air as much as possible until the solution is ready to titrate, by replacing the stopper as quickly as possible after each reagent is introduced; (2) to get complete solution of the precipitate by the hydrochloric acid; (3) to give the thiosulphate a little more time to react at the endpoint in the acetic acid condition; (4) to use small amounts of starch solution. For introducing the solutions it is advisable to use pipettes with two marks, measuring 2 cc. well up on the pipette so as to give head and not contaminate the upper liquid in the bottle more than necessary while actually displacing liquid from the bottle in proportion to the amount introduced.

"Samples for oxygen may be taken and transported elsewhere for titration in ground glass stoppered bottles with part of the chemicals added, either in alkaline or acid condition, if kept out of contact with air. The alkaline condition is preferable."

Estimation of starch and dextrin in sugar products, confectionery, etc., A. Auguet (*Ann. Falsif., 6 (1913), No. 53, pp. 143–147; abs. in Jour. Chem. Soc. [London], 104 (1913), No. 607, II, p. 448*).—In the method 0.5 gm. of the substance under examination is inverted at 70° C. with 1 per cent hydrochloric acid. Another 0.5 gm. portion is inverted by heating with 2 per cent hydrochloric acid for 1 hour at 110°. The reducing sugars are then estimated with Fehling's solution in the usual manner. The difference between the two estimations, expressed in terms of invert sugar, is multiplied by 0.9 to give the quantity of starch or dextrin.

"A preliminary examination of the substance under the microscope, and a test with iodin solution, will show whether starch or dextrin is present, or which of these preponderates."

Determination of quercetin in wine, T. von Fellenberg (*Mitt. Lebensm. Untersuch. u. Hyg., Schweiz. Gsndhtsamt., 4 (1913), No. 1, pp. 1–14*).—In the examination of red wine a yellow coloring matter was noted which gave the reactions applied by Heise to similar substances, i. e., those with lead acetate, iron acetate, ammonia, and concentrated sulphuric acid.

The coloring matter present in wine was found to be more soluble in water than that from other sources and did not give a blood red reaction with silver nitrate. Various wines were then examined for the presence of this substance and the results obtained were compared with those given by standards of wool dyed with authentic quercetin. It colored wool, mordanted with clay, yellow, and wool, mordanted with clay and tin salts, a very pure yellow. When the tin salt was in preponderance the color was more intense. Unmordanted plant or animal fibers were not affected by the coloring matter.

The coloring matter which exists only in traces in white wines and in larger amounts in red and white wines, and red wines made from dregs, is formed during fermentation, especially from the substances which make up the dregs, i. e., skins, stems, and seeds: consequently the detection of this coloring matter is a medium whereby one can often determine wine made from dregs. Heating wine with dilute sulphuric acid was found to increase the coloring matter content of wine.

For the purpose of determining whether Neubauer's conclusions were correct, 1 kg. of grape wine was extracted with 3 liters of water in an autoclave at 130° C. The solution was treated with ether, the ether extract was brought to dryness, and the crystalline residue extracted with water and recrystallized from dilute alcohol. In this experiment 0.17 gm. of the coloring matter was obtained in the form of fine microscopic needles which melted at 250°. The combustion showed a formula similar to that calculated for quercetin. The reactions for the substances were also positive. The green plants, or plant parts green during some stage of their growth, such as skins and hulls of fruits, and flowers, yield on heating with dilute sulphuric acid yellow coloring matters which are considered decomposition products of a substance which accompanies chlorophyll. The yellow coloring matter of wine in all probability consists of quercetin, traces of quercetin, and the decomposition product of an accompaniment of chlorophyll.

Estimation of the bromin absorption of wines, T. von Fellenberg (*Mitt. Lebensm. Untersuch. u. Hyg., Schweiz. Gsndhtsamt., 4 (1913), No. 1, pp. 14–41, figs. 5*).—The results show the possibilities in this determination for detecting adulterations in wines. Sugaring and watering can be easily detected.

Practicum of milk chemistry, O. VON SOBBE (*Milchchemisches Praktikum. Leipsic, 1913, pp. V+162*).—This book is designed for self-instruction and for dairy laboratories, in place of the author's previous work called the A B C des Molkereibeamten (A B C of the Dairy Official). In addition to the usual methods for examining dairy products the chemical and biologic methods employed on the European Continent are described with much detail.

A new method for the determination of the protein in milk, W. C. DE GRAAFF and MLLE. A. SCHAAP (*Ann. Falsif., 6 (1913), No. 53, pp. 149–157*).—This is a study and criticism of Steinegger's method.

It was found that with unboiled cow's milk the factor for 1 gm. of protein obtained by the authors agreed well with the figure found by Steinegger, 2.06 (E. S. R., 17, p. 696), but not with that noted by Richmond, 2.23 (E. S. R., 22, 39). Steinegger's claim that no change of the aldehyde index after heating the milk to 120° C. takes place could not be borne out because the figures obtained by these workers were very variable. Ordinary pasteurization or sterilization evidently produces some changes in the protein substances. Dilution did not alter the aldehyde index.

Six samples of women's milk were also studied in this regard, and the aldehyde index for 1 gm. of woman's milk protein was found to be 2.26. The aldehyde index for 1 gm. of the protein of buttermilk was 3.15. The difference in value between the normal proteins and the proteins of buttermilk is not believed to be due to the development of lactic acid but probably to cleavage of protein taking place under the influence of the micro-organisms present.

The addition of lactic acid did not affect the results. See also other notes (E. S. R., 18, p. 8; 27, p. 209).

A simple method for determining the fermenting capacity of various feeding stuffs, milk, and the galactase of milk, A. ROSAM (*Milchw. Zentbl., 42 (1913), No. 7, pp. 193–195, figs. 2*).—Infant foods and feeds for animals often contain micro-organisms which gain entrance to the gastrointestinal tract where they exert a detrimental effect. For determining the fitness of such foods, a method is proposed which is said to be a modification of the author's prior procedure.

The apparatus consists of a tall, tapered, flat-bottomed flask supplied with a rubber cork through which a glass tube passes. The tube dips into the flask 5 cm. below the cork while the outside portion of the tube is from 30 to 50 cm. above the cork. If a food is to be examined, a definite portion is mixed with water and the apparatus with its contents is attempered at 35 to 40° C. The height to which the fermenting mixture rises in the glass tube at the end of three hours is compared with the standard set down. As a basis for the test a rise of 30 cm. in three hours is taken. This fermentation is designated $\frac{30}{3}=10=100$ per cent.

If the effect of feces or other contaminating substances upon milk is to be studied, sterile milk is substituted for the water.

Tests made gave the following figures: Feed beets, 43 to 60 per cent; fresh beet chips, 30 to 50; soured beet chips, 10 to 18; dried chips, 25 to 40; green, dirty cabbage leaves, 40 to 60; bran, 50 to 70; hay, 30 to 45; fresh brewers' grains, 0.5 to 5; unclean straw, 65; feces, 50 to 70; and milk, 4 to 20 per cent.

As the results obtained with the different materials vary, it is necessary to set up a standard for each kind of material to be tested. The fermenting power of feces depends very much upon the kind of feed an animal receives. The feces of animals affected with dysentery yield high figures.

The apparatus described can also be used for catalase determination.

The determination of nitrobenzol in peanut oil, H. J. LUCAS (*Jour. Indus. and Engin. Chem., 5 (1913), No. 7, pp. 576, 577*).—Nitrobenzol is usually added

to peanut oil for the purposes of giving the oil a pleasant odor and deceiving the public into thinking that the product is oil of bitter almonds. A method for determining its presence is given, and some analyses of mixtures of peanut oil and nitrobenzol of known strength and also of two mixtures of lard oil and nitrobenzol are presented.

Determination of total formaldehyde in fumigators and commercial solutions, J. J. HINMAN, JR. (*Jour. Indus. and Engin. Chem., 5 (1913), No. 9, pp. 752–755*).—"For an occasional analysis, the methods of Haywood and Smith and Seyewetz and Gibello seem to be preferable, while in a plant producing formaldehyde or where a large number of samples are to be analyzed, Kleber's method would be the most desirable. Legler's method gives too low results and Blank and Finkenbeiner's gave the highest ones. Haywood and Smith's method gave slightly lower percentages than Blank and Finkenbeiner's, closely followed by Kleber's and the remaining methods." A bibliography is included.

The thermal figure of oil of turpentine, C. GRIMALDI and L. PRUSSIA (*Chem. Ztg., 37 (1913), No. 65, p. 657*).—If pinene, of which two optically active forms go chiefly to make up oil of turpentine, is treated with concentrated sulphuric acid, an active exothermic reaction takes place with a simultaneous formation of oxidation and reduction products.

A method has been worked out whereby it is possible to determine the thermal figures characteristic for turpentine. The test is carried out in Tortelli's thermoleometer (E. S. R., 22, p. 311) and as a reagent 1 part of sulphuric acid is dissolved in 7.5 parts by volume of cooled amyl alcohol. The test is conducted as follows: Twenty cc. of the oil of turpentine is allowed to flow dropwise into the vacuum chamber and the temperature noted; then 10 cc. of freshly prepared reagent is run into the turpentine oil, and the mixture is stirred until a constant temperature is obtained. The difference between the two temperatures is the heat evolved, or the thermal number of the oil.

French, Portuguese, Spanish, Austrian, and Greek oils gave figures varying from 77 to 85.7. The same oils by distillation with lime gave similar figures. Fractions boiling at 155 to 156° C., which are comparable to pinene, gave somewhat lower figures. American turpentine oils not prepared in the laboratory also gave figures corresponding to those stated above. Badly stored oils gave an increased thermal figure. The distillation of ozonized oils over sodium gave the characteristic figures of good oils.

The use of the method for detecting adulterations suggested itself.

Loganberry by-products, C. I. LEWIS and F. R. BROWN (*Oregon Sta. Bul. 117 (1914), pp. 3–32, figs. 9*).—This is a preliminary report which deals with the picking, handling, and utilization of the loganberry for the preparation of canned fruit, evaporated fruit, fruit juice, and sirup. Plans and descriptions of systems of evaporation are presented, and practical hints, based on experimental work, are given for the purpose of overcoming many of the causes of failure which have been heretofore experienced in this comparatively new industry. The principles involved in evaporating are much the same for both prunes and loganberries, but climatic conditions are very different during the two seasons. It will not always follow, therefore, that because an evaporator works successfully for prunes it will work equally well for loganberries.

Analyses of loganberry juice from berries at various stages of ripeness are presented. Juice made from very ripe fruit retained a more distinct flavor and had a higher quality. It is pointed out that the fruit juice may be utilized, not only for the preparation of vinegar and wine but also in frozen products (ices and ice creams), gelatin desserts, puddings, and pies, recipes for which are presented. The commercial aspects are also considered.

METEOROLOGY—WATER.

Agricultural meteorology. R. F. STUPART (*Agr. Gaz. Canada, 1 (1914), No. 3, pp. 210, 211*).—A brief account is given of the action of the General Assembly of the Institute of Agriculture at Rome in May, 1913, with reference to the proposed work of the permanent commission for the study of agricultural meteorology.

The questions which this commission should consider are outlined as follows: Statistics of losses occasioned by storms in relation to the possible maximum; importance of daily reports of the weather in order to establish statistics regarding favorable conditions; means of disseminating general meteorological information among agriculturists; the connection existing between the harvest and the various atmospheric elements; establishment of the atmospheric conditions which lead to the best agricultural results in any year; establishment of notes or percentages for the good year and for normal years; special study of the elements of a good year; study of the various elements which contribute to a good harvest—(a) weather, (b) sunshine, (c) heat, (d) quantity of rain required for a good harvest; and the establishment of a Meteorological Information Office for Agriculturists.

In accordance with these suggestions the meteorological service of Canada has established a new division for the study of the connection between weather and the growth of crops and has placed the work in charge of R. W. Mills.

Comparative agricultural and forestry meteorology. E. CUIF (*Bul. Soc. Sci. Nancy, 3. ser., 14 (1914), No. 3, pp. 225–307, pls. 3, figs. 4; abs. in Rev. Sci. [Paris], 52 (1914), II, No. 2, p. 50*).—A continuation and summary of previous investigations (E. S. R., 22, p. 44; 27, p. 816) is given in this article, which deals with (1) influence of forest cover on the temperature of the soil at different depths, (2) influence of the degree of forestation on the amount of rainfall, and (3) the influence of leafy and coniferous forest growth on the temperature and humidity of the air.

The more important conclusions are that forest growth exerts a decided influence on diurnal variations in temperature of the air, the maximum being much lower and the minimum much higher than in the air of unforested areas. The influence on the temperature of the soil, however, is comparatively small and disappears entirely at a depth of 0.2 meter. Forest growth appears to have considerable influence on the frequency of rainfall, although little upon the amount. It appears to increase the number of rainy days and to reduce the number of torrential rains. The absolute humidity is higher and the relative humidity is lower in the forest than in the open country on account of the lower temperature prevailing in the former. This is true to a greater extent in coniferous forests than in those of leafy growth and is most pronounced during the period from April to October.

Climatological data for the United States by sections (*U. S. Dept. Agr., Weather Bur. Climat. Data, 1 (1914), Nos. 3, pp. 248, pls. 2, figs. 9; 4, pp. 238, pls. 2, figs. 8*).—These numbers contain respectively brief summaries and detailed tabular statements of climatological data for each State for March and April, 1914.

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. OSTRANDER, E. K. DEXTER, and R. E. MCLAIN (*Massachusetts Sta. Met. Buls. 305, 306 (1914), pp. 4 each*).—Summaries of observations at Amherst, Mass., on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during May and June, 1914, are presented. The data are briefly discussed in general notes on the weather of each month.

Meteorological observation, 1913 (*Agr. Students' Gaz., n. ser., 16 (1914), No. 6, pp. 194–199*).—This article gives summaries of observations on the temperature of the air and soil, rainfall, and sunshine at the Royal Agricultural College, Cirencester, and briefly reviews the weather conditions at this place and of the whole of England.

It is stated that the year was characterized by a wet spring, a dry summer, which was neither sunny nor warm, and a mild autumn, with no very wide fluctuations of temperature over the whole country. The rainfall was generally for the country as a whole slightly below the average. The total rainfall at the college was 30.52 in., measured on 184 days. The average temperature was 47.6° F. The duration of bright sunshine was everywhere considerably less than the average.

Temperature records, J. B. THOMPSON (*Guam Sta. Rpt. 1913, pp. 22–24, figs. 2*).—Records of maximum and minimum temperatures at the Guam Station throughout the year ended June 30, 1913, are shown in charts.

American temperatures and European rainfall, W. J. HUMPHREYS (*Jour. Wash. Acad. Sci., 4 (1914), No. 13, pp. 345–347, fig. 1*).—Data are presented to show that "high annual average temperatures in America must lead to correspondingly heavy precipitation in Europe and, conversely, that persistently low average American temperatures must be accompanied by more or less correspondingly light European precipitation."

Chemical composition of rain in the Union of South Africa, C. F. JURITZ (*So. African Jour. Sci., 10 (1914), No. 7, pp. 170–193, pl. 1; abs. in Jour. Chem. Soc. [London], 106 (1914), No. 621, I, p. 916*).—The results of determinations of nitrogen and chlorin in rain water collected at different places in the Union of South Africa more or less continuously from September, 1910, to December, 1912, are reported. The results for nitrogen are summarized in the following table:

Nitrogen in rain water of South Africa, in pounds per acre.

Locality and period.	Summer: September to February.			Winter: March to August.		
	As ammonia.	As nitrates.	Total.	As ammonia.	As nitrates.	Total.
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
Grahamstown (Sept., 1911, to Aug., 1912)	0.592	0.465	1.057	0.448	0.264	0.712
Bloemfontein (Sept., 1910, to Aug., 1911)	1.425	.907	2.332	2.233	.713	2.946
Bloemfontein (Sept., 1911, to Aug., 1912)	3.244	1.077	4.321	1.626	.286	1.912
Durban (Sept., 1911, to Aug., 1912)	2.739	.780	3.519	1.796	.295	2.091

The chlorin content varied with distance from the sea.

Electrical hail protection, A. ANGOT (*Ann. Soc. Mét. France, 62 (1914), Mar., pp. 82–85*).—The efficiency of various electrical devices which have been proposed for protection against hail is briefly discussed, the general conclusion being that the results have been unconvincing as to the efficiency of these devices. The extension of installations for this purpose is discouraged.

Studies in water supply, A. C. HOUSTON (*Abs. in Chem. News, 109 (1914), No. 2834, p. 143*).—This monograph is practically a summary of papers and articles published by the author, embodying the results of his personal experiences and giving accounts of his investigations. Tables of results and graphical representations are given relating to bacteriological and chemical tests, and processes of purification and sterilization are described. The question of the connection between the purity of water supplies and the prevalence of

disease is treated and routine methods of bacteriological work are described in detail. Methods of collecting and labeling samples, registering results, and decimally diluting samples are first treated, and a chapter is devoted to a detailed description of the exact method followed in the examination of a sample of raw river water. Full accounts are included of each day's work, and the composition of the culture media used for the different tests is also given.

The utilization of sewage in agriculture, J. GROSSMANN (*Rpt. Brit. Assoc. Adv. Sci., 1913, pp. 771, 772; abs. in Mark Lane Express, 110 (1913), No. 4277, p. 383; Chem. Ztg., 38 (1914), No. 34, p. 373*).—Abstracts are given of a paper presented at the Birmingham meeting of the British Association, 1913, describing more particularly the system installed by the author at Oldham for the recovery of grease and the preparation of fertilizer from sewage sludge (E. S. R., 30, p. 19).

Sewage disposal, G. J. FOWLER (*Times [London], 1914, Mar. 11, English Sup.; abs. in Jour. Soc. Chem. Indus., 33 (1914), No. 7, p. 372*).—The extent to which sewage sludge is used as fertilizer in the British Isles is discussed.

It is stated that "at Manchester the 'slurry' from the washing of the contact beds is being dried, powdered, and sold to Canada at a price which covers cost. At Bradford the crude sewage is 'cracked' with sulphuric acid, the resulting sludge hot pressed, the grease recovered and sold at a profit, and the residual sludge cake sent to northern France for intensive gardening. At Oldham the sludge is distilled and the residue sold. At Dublin the sludge is fermented by yeast, which causes a separation of water; the solid sludge is dried and the resulting powder sold for 50 shillings a ton. An organism has been isolated from the water of an old colliery which has the property of precipitating iron in presence of organic matter. When this organism was added to an effluent together with a salt of iron and then air blown in, complete clarification was obtained; the deposit produced had a high nitrogen content."

Sewage irrigation and disease organisms, CIOCALTEU (*Compt. Rend. Soc. Biol. [Paris], 74 (1913), No. 24, pp. 1411–1413*).—A study of the question whether disease organisms applied to the soil in sewage are able to gain entrance into the interior of plants grown on the soil is reported. The results indicate that where there is no injury to the underground parts of the plants the germs do not enter the plant, but that a very slight injury is sufficient to allow the germs to gain entrance.

SOILS—FERTILIZERS.

Report of the meeting of the international commission for the mechanical and physical examination of soil, F. SCHUCHT (*Internat. Mitt. Bodenk., 4 (1914), No. 1, pp. 1–31, fig. 1; abs. in Rev. Sci. [Paris], 52 (1914), I, No. 14, p. 439*).—This commission of fourteen delegates, representing Germany, Sweden, Brazil, Holland, Hungary, and the United States, discussed methods of mechanical and physical analysis of soils and agreed upon the following:

(1) Group soil particles according to Atterberg's classification: Grains greater in size than 20 mm.—pebbles; those from 20 to 2 mm.—gravel; 2 to 0.2 mm.—coarse sand; 0.2 to 0.02 mm.—fine sand; 0.02 to 0.002 mm.—dust; and grains smaller than 0.002 microns—colloidal particles and raw clay.

(2) Subdivision of groups to be left to the judgment of the analyst.

(3) Preparation of samples for mechanical analysis by sifting through a 2 mm. mesh sieve, soil to be still moist. This applies only to soils rich in humus.

(4) For sedimentation use apparatus similar to Atterberg's in which all particles up to $\frac{1}{2}$ mm. in size are separated by sifting, and then levigate samples into a graduated flask.

(5) In samples poor in clay the clay should be weighed directly, but in samples rich in clay it may be estimated by differences.

(6) The humus content should be computed as one-half of the carbon dioxid obtained in ordinary organic analysis for carbon determination.

(7) Compare the trituration of the sample with the thumb according to Atterberg with that by shaking according to Hissink.

The new classification of the granulation products in mechanical analysis. J. KOPECKÝ (*Internat. Mitt. Bodenk., 4 (1914), No. 2–3, pp. 199–202*).—The author criticizes the classification of soil grains noted above, compares it with the old classification according to Schöne, and concludes that the modification of the washing process and the rinsing apparatus is not necessary or justified.

Vegetation and agricultural soil, G. DE ANGELES D'OSSAT (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5 ser., 22 (1913), I, No. 1, pp. 876–878, fig. 1*).—The author concludes from his observations of natural soils that the vegetation best adapted to a soil can not be accurately determined from a geological map of the soil area, owing to the many physical, mechanical, and more particularly, chemical changes to which the original rock may be subjected during the transformation into agricultural soil.

The radio-activity of some type soils of the United States, R. B. MOORE (*Jour. Indus. and Engin. Chem., 6 (1914), No. 5, pp. 370–374, fig. 1*).—The author reports chemical examinations of samples of several type soils of the United States to determine their radium and thorium contents.

Of the 7 types examined for radium, the soil of 4 was more active than the subsoil, while in the other 3 the reverse was true. The average activity of the soils was 1.97×10^{-12}, and of the subsoils 1.52×10^{-12}.

"There seems to be a fairly definite relationship between the activity and the combined amounts of barium and strontium. In the majority of cases the soil or subsoil which has the highest activity also has the largest amount of barium plus strontium. . . . The same reaction holds fairly well with the amount of sulphur present. . . . Since radium has an insoluble sulphate, which precipitates with the sulphates of barium and strontium, the results seem to indicate that radium in the soil is very largely, if not entirely, in the form of sulphate."

The thorium determinations in five of the types showed small variations and "seem to indicate that soils contain more thorium than most rocks."

Olifants River irrigation scheme (Van Rhynsdorp division). Flying agricultural survey of the soils of the irrigable area, C. F. JURITZ (*Union So. Africa Dept. Agr. Sci. Bul. 5 (1914), pp. 30; Agr. Jour. Union So. Africa, 7 (1914), No. 4, pp. 541–546*).—The prevailing soil types of the Van Rhynsdorp division of the project are described and discussed with reference to mechanical and physical structure and plant food and alkali content. The prevailing types are the so-called Karroo soils, consisting of red sands and sandy loams, and alluvial soils, consisting of drab-colored loams and fine sandy loams. The alluvial soils are generally of finer texture than the Karroo soils. "The average alluvium contains only 31 per cent of material coarser than 1/10 of a millimeter, as against 68 per cent contained by the average 'Karroo' soil. On the other hand, no less than 54 per cent of the average alluvium is silt and clay of finer grade than 1/20 of a milimeter, and in the 'Karroo' soils this averages only 19 per cent."

Of the two Karroo soils the sands are classed as much the poorer chemically than the finer-grained sandy loams. Except in phosphorus content the Karroo soils did not appear to differ greatly from the average alluvium in mineral plant food content. The alluvial soils examined were not invariably rich in plant food, and the most marked chemical deficiency found in all the soils

analyzed was in regard to nitrogen. The soils of the northern part of the area were found to be fairly well supplied with lime, while many of those of the southern part were deficient. Comparatively few of the soils examined are classed as deficient in phosphoric acid or potash.

Out of the 45 soil samples analyzed for alkali only 9 samples, 7 of which were Karroo soils, contained sodium carbonate, which occurred in very small amounts and only in the surface soil. Sodium chlorid composed the bulk of the alkali salts.

Pakihi lands: Note on their treatment, B. C. Aston (*Jour. Agr. [New Zeal.]*, 7 (*1913*), *No. 3, pp. 295–300, figs. 4*).—The results of field and pot tests indicate that the chief need of these lands, which have been described previously (E. S. R., 23, p. 621) is for lime and phosphorus, and that they may be profitably reclaimed where cheap ground limestone or quicklime and phosphate are available.

The storage and use of soil moisture, W. W. Burr (*Nebraska Sta. Research Bul. 5 (1914), pp. 88, figs. 20*).—The results of field studies of soil moisture accumulation and conservation conducted for 6 years on fairly uniform fine sandy loam soil at the North Platte substation are reported.

Under field conditions the maximum capacity for water of the soil in question was found to be from 16 to 18 per cent of its dry weight, of which above 7 to 8 per cent is available for plant use. The more important findings are summarized as follows:

Summer tillage is the most effective means of storing water in the soil, the annual storage by this means varying from 10 to 33 per cent of the seasonal rainfall, according to the amount and distribution of the rainfall, the effectiveness of the tillage, and the presence or absence of a growing crop. Plowing seems better than disking for accumulating water in the soil, although disking small grain stubble to kill weeds and stir the surface is generally effective. Artificial mulches of straw or hay are more effective than soil mulches in absorbing and retaining rain water, and a 3-in. mulch is more effective than a shallower one. Corn, oats, spring wheat, and barley use water from the first 4 or 5 ft. of soil, winter wheat at a depth of 6 or 7 ft., and alfalfa and grasses when well established at much greater depths. Under normally favorable conditions growing vegetation is a greater factor than surface evaporation in removing water from soil, and weeds are frequently the most effective agents in removing available water from soils and in preventing the storage of water for the use of other plants. Capillary movement is feeble in soils that are dried to any considerable extent below the saturation point, so that in the main the plant roots to obtain water extend themselves into the soil where available water is present rather than depend upon capillarity.

In order to store water in these soils it is necesary that the soil surface should be in condition to catch rains, and kept loose and rough by cultivation to reduce evaporation and prevent blowing. Weeds should be suppressed, as far as possible, before and after seeding. Crops which will withstand considerable drought or escape drought by maturing early should be chosen.

The storage and use of soil moisture, W. W. Burr (*Nebraska Sta. Bul. 140 (1914), pp. 20*).—A popular edition of the above.

Mineral acid soils, O. Loew (*Landw. Jahrb., 46 (1914), No. 1, pp. 161–164*).—The author reviews his own and other studies on mineral acid soils of several tropical countries, particularly Porto Rico (E. S. R., 29, p. 815), with special reference to the determination and correction of the acidity and the relation of acidity to the biological activities of the soil. Such soils are thought to owe their acidity chiefly to acid clay constituents.

Some notes on soil protozoa, C. H. MARTIN and K. R. LEWIN (*Phil. Trans. Roy. Soc. London, Ser. B, 205 (1914), No. 315, pp. 77–94, pls. 2*).—This paper gives an account of protozoan organisms found in two different kinds of soil by a special method devised by one of the authors. Three new species are described, *Vahlkampfia soli*, *Amœba cucumis*, and *A. gobanniensis*.

"The main purpose of this introductory paper has not, however, been the study of these amœbæ from a specific point of view, so much as the proof which we hope to have brought of the existence of a relatively frequent trophic protozoan fauna in certain soils and the rough indication of some possible methods of dealing with this fauna. How far this fauna under certain conditions exercises a deleterious influence on plant growth is rather a question for the agriculturist than the zoologist.

"The startling success in the Lee Valley of the treatment of sick soils by partial sterilization, introduced by Russell, would seem to present a very strong argument in favor of the view that these protozoa do exercise an important influence on plant growth in these soils. We have, by means of the method described above, been able to establish the occurrence of a trophic protozoan fauna in certain field soils that we have examined, and to this question we hope to return in a future paper."

A bibliography of 29 references to literature on the subject is given.

Methods in soil bacteriology.—VII, Ammonification and nitrification in soil and solution, F. LÖHNIS and H. H. GREEN (*Centbl. Bakt. [etc.], 2. Abt., 40 (1914), No. 19–21, pp. 457–479*).—A continuation of previous studies of factors effecting ammonification and nitrification in soil and solution (E. S. R., 30, p. 218) is reported.

Aeration, the concentration of the material undergoing decomposition, and more particularly, its distribution in the medium, were found to be important factors for ammonification. In certain specimens of blood meal there appeared to be components which very seriously hindered ammonification in solution and in saturated soil, and to a much less extent in well aerated soil or sand media.

In solution or in sand media, higher concentrations of ammonia lowered the nitrification. The alkaline reaction resulting from the use of basic magnesium carbonate to cultivate the nitrite organisms hindered or suppressed the effective conversion of nitrite into nitrate, as did also the adoption of a temperature of from 30 to 35° C. Neutral chalk gave more satisfactory results than did magnesium carbonate. It is pointed out that by varying the conditions in regard to depth of layer analytical figures for nitrification in solution tests may be made to run above, below, or parallel with those of soil tests. "The same solution, if supplied with both sodium nitrate and ammonium sulphate, may give rise to nitrification in shallow layer and denitrification in deep layer; if further supplied with suitable organic compounds, may lead to nitrate assimilation in shallow layer."

It is concluded that no necessary fundamental difference exists between bacteriological processes in soil and solution media, and that the most important factors in both are: (1) Nature and quantity of material used as substrata; (2) concentration and distribution of the substrata in the medium; (3) aeration; (4) diffusion, absorption, destruction, or evaporation of metabolic products; (5) reaction of the medium; (6) temperature; and (7) duration of the experiment.

"The fact that in soil tests, in consequence of absorption, more perfect distribution of substrata, and superior aeration, the processes in the laboratory may proceed faster than in solution, does not by any means justify the conclusion that soil tests more closely represent field conditions." Observations concerning the course of decomposition processes in the field are mentioned as indicating

that suitably arranged solution tests may afford equally, if not more, instructive information than soil tests. "By suitable addition of glass-wool, sand, chalk, humus, etc., tests which are primarily 'in solution' may be so arranged as to separate at least partially the conglomeration of factors involved in soil tests."

The absence of nitrate formation in cultures of Azotobacter, K. F. KELLERMAN and N. R. SMITH (*Centbl. Bakt. [etc.], 2. Abt., 40 (1914), No. 19–21, pp. 479–483, fig. 1*).—Studies of cultures of Azotobacter indicate that while these strains are capable of fixing appreciable quantities of free nitrogen, they are apparently unable to produce nitrates.

Fertilizers in relation to soils and crop production, R. HARCOURT and A. L. GIBSON (*Ontario Dept. Agr. Bul. 223 (1914), pp. 30, figs. 2*).—This is a popular discussion explaining the use of manures and fertilizers in the improvement of soils.

Manurial requirements, PRIMROSE MCCONNELL (*Jour. Agr. [New Zeal.], 8 (1914), No. 1, pp. 43–49*).—The results of two years' observations on the experimental farm at Ruakura are briefly summarized in this article, the general conclusions being that the soil of this farm, as in case of New Zealand soils in general, does not need nitrogen if a proper rotation of crops is practiced; that phosphoric acid, particularly in the form of basic slag and guano, gives uniformly good results; that comparatively little result, good or bad, is obtained from the application of potash except in the case of potatoes and mangels; and that liming, particularly on the raw and apparently more sterile parts of the farm, together with draining, is necessary to bring the soil into a profitable state of cultivation.

The inefficiency of fertilizers in dry farming regions, F. COUSTON and B. GARRIGUES (*Rev. Dry-Farming Nord Afric., 1912, Nos. 2, pp. 30–36; 3, pp. 59–62; 1913, No. 6, pp. 168–172*).—Experiments on the high plateaus of Algeria, where the winter is cold, the summer very hot, and the spring and autumn very dry, and the annual precipitation varying from 180 to 500 mm. and averaging 320 mm., showed almost uniformly no benefit from the use of fertilizers. The failure of the fertilizers to increase the crop yields is attributed to deficiency of moisture in the soils.

Fertilizer experiments in the German colonies (*Düngungsversuche in den Deutschen Kolonien. Berlin: Kolonialamt, 1913, No. 3, pp. III+64, pls. 6, fig. 1*).—An account is given of experiments carried out in German East Africa in 1912 and 1913 and of those planned for 1914. The crops experimented with included cotton, corn, sorghum, rye, wheat, barley, garden beans, mungo beans, peanuts, potatoes, alfalfa, rubber, coffee, cacao, coconuts, sisal, besides various forage plants and vegetables. The general conclusion reached is that as a rule fertilizers produced a profitable increase in yield.

The plant food content of liquid manure, P. LIECHTI and E. TRUNINGER (*Landw. Jahrb. Schweiz, 27 (1913), No. 8, pp. 459–474*).—Analyses of a large number of samples of liquid manure as used by Swiss farmers are reported.

Some of the samples represented liquids obtained without the addition of water. In other cases a certain amount of water had been added in their preparation. All of the samples contained more or less suspended matter. The analyses showed wide variations in composition but the average of all analyses showed 1.7 gm. of total nitrogen, 70 per cent of which was in the form of ammonia, in 1 liter of liquid; 4.37 gm. of potash; and 0.3 gm. of phosphoric acid.

The escape of ammonia from soil treated with liquid manure, P. LIECHTI and E. RITTER (*Landw. Jahrb. Schweiz, 27 (1913), No. 8, pp. 436–458*).—The authors report further investigations (E. S. R., 25, p. 22) from which they

conclude that the addition of superphosphate to liquid manure in the quantities generally used in practice has little or no tendency to prevent the nitrogen losses due to the evaporation of ammonia from the soil, also that the effect of the liquid manure on the superphosphate is to render a part of the phosphoric acid insoluble. Field experiments on the utilization of the nitrogen of liquid manure in the production of green forage verified the results of the prevous experiments referred to above regarding the losses of nitrogen through evaporation. They further indicate that the neutralization of liquid manure with superphosphate is not feasible, but that the practice of making relatively large applications of liquid manure in the production of green forage may be followed provided the soil does not become deficient in phosphoric acid.

Sodium nitrate v. ammonium sulphate, K. Pospíšil (*Wiener Landw. Ztg., 64 (1914), No. 18–19, pp. 163, 164*).—Comparative tests of sodium nitrate and ammonium sulphate in field experiments with sugar beets extending over four years, two of which were dry and two wet, showed that the sulphate gave better results than the nitrate in the wet seasons, although the nitrate gave better results in the dry seasons and as an average of the four years.

Pot experiments with ammonium sulphate containing sulphocyanid, A. Stutzer and S. Goy (*Jour. Landw., 62 (1914), No. 2, pp. 149–158; abs. in Jour. Chem. Soc. [London], 106 (1914), No. 621, I, p. 916*).—Previous investigations on this subject by others are reviewed and a brief bibliography of the subject is given. The author made water culture and pot experiments on corn, mustard, summer rye, oats, wheat, and barley with commercial ammonium sulphate and mixtures of pure salts containing varying amounts of sulphocyanid.

In the water cultures it was shown that small amounts of sulphocyanid were stimulating but larger amounts were toxic. In the soil cultures the results confirm those of Wollny and Böhmer in showing that ammonium sulphate containing as much as 1 per cent of sulphocyanid can be safely used if applied at ordinary rates.

Mixing lime nitrogen with Thomas slag and kainit, Gerlach and O. Tiedemann (*Illus. Landw. Ztg., 34 (1914), No. 28, p. 273*).—Experiments with oiled calcium cyanamid as well as with mixtures of 3 parts of kainit, 2 of Thomas slag, and 0.5 and 1 of cyanamid are briefly reported.

The oiled cyanamid gave somewhat better results as measured by crop yields than the untreated. It was found that the mixtures of kainit, slag, and cyanamid were of good mechanical condition and underwent little chemical change except a small loss of water-soluble potash in 10 days.

The effects of the ensilage process on the solubility of floats, E. B. Forbes and C. M. Fritz (*Jour. Indus. and Engin. Chem., 6 (1914), No. 3, pp. 222, 223*).—Floats was mixed with corn in the proportion of 1 part of the former to 250 parts of the latter, and the mixture was ensiled in earthen jars for 6 months.

Determinations of the different forms of phosphoric acid in the original material and in untreated and phosphated silage are reported, and showed that the water-soluble and citrate-soluble phosphorus in the phosphated silage was not higher than in the untreated silage. There was, however, a very considerable increase in inorganic phosphorus soluble in 0.2 per cent hydrochloric acid, the phosphated silage containing more than twice as much as the untreated silage. The authors conclude from these results that "the ensilage of corn will render soluble in 0.2 per cent hydrochloric acid such an amount of the phosphorus of floats added to corn as to constitute a practical consideration in the feeding of live stock."

The production of phosphate rock in 1913, W. C. Phalen (*U. S. Geol. Survey, Mineral Resources of the United States, Calendar Year 1913, pt. 2, pp. 273–289*).—Statistics of production in the United States and other countries are

presented. The phosphate industry in the different States is also briefly discussed and general information of interest to those engaged in the phosphate trade is given. The marketed production of phosphate rock in the United States in 1913 was 3,111,221 long tons valued at $11,796,231, representing an increase of 5 per cent in output and 1 per cent in value over the corresponding figures for 1912.

The fertilizing value of phonolite, R. NEUMANN (*Fühling's Landw. Ztg., 63 (1914), No. 8, pp. 278–291, figs. 2*).—Field and pot tests are reported of a form of phonolite consisting mainly of leucite, which, it is claimed, is more effective as a potash fertilizer than the ordinary forms and promotes nitrogen fixation. The results failed to confirm these claims and showed that while the phonolite had a slight fertilizing value this was in no sense comparable with that of ordinary potash fertilizers.

Potash salts and other salines in the Great Basin region, G. J. YOUNG (*U. S. Dept. Agr. Bul. 61 (1914), pp. 96, pls. 6, figs. 8*).—This is an account of investigations carried on in cooperation with the U. S. Geological Survey and the Mackay School of Mines of the University of Nevada.

The region explored included practically the entire State of Nevada, the southern part of Oregon, the western part of Utah, and certain sections of eastern and southeastern California, and comprised an area of between 208,500 and 210,000 square miles. The report deals fully with the origin, formation, and character of the saline deposits.

It is pointed out that potash deposits similar to those of Stassfurt, Germany, can hardly be expected to occur in the Great Basin. The saline deposits of the Great Basin represent comparatively recent geological activity and are not the result of extreme desiccation even in the older deposits. The present deposits are in process of formation. "It may be said that the basin deposits already discovered represent the initial stages of what in time might result in deposits rather remotely similar to Stassfurt, but of much less magnitude. . . .

"With the exception of the crusts and efflorescences about hot springs and in soils, no notably high potassium content has been reported from salines taken from beds. The potassium content in material of this nature ranges from less than 1 to 2 per cent. It is not in the salts which have crystallized out, but in the residual brines or mother liquors that concentration of potassium has taken place, and it is to these that we must look for potassium salts. As desiccation approaches completion so will the residual brines increase in proportion of potassium. A near approach to complete desiccation would give a brine high in potash. . . .

"Two general types in the desiccation phenomena may be distinguished, the Searles type, in which a large, deep lake was evaporated, and the comparatively thick body of saline material, restricted in area and saturated with residual brine, was formed; and a second type, which is best illustrated by Death Valley, in which case we have the building up of a mass of muds and silts with interbedded salines, by the repeated formation and desiccation of a shallow lake. To the latter type belong most of the desert, dry lakes, or playas. The line between the two types is not a sharp one."

The possibility of deep deposits is considered to be uncertain though not completely disproved. In view of this uncertainty deposits such as those occurring in Searles Lake which have resulted from desiccation of the most recent Quaternary lakes seem to be of most significance. Of the various basins examined "Searles is the only one in which the investigation has shown sufficient concentration of potassium salts in the residual brines to be of probable commercial importance. . . . The presence of brines of moderate concentration is shown

in Death Valley and Silver Peak. It is a matter of some doubt whether these brines can be worked. The investigation of the Carson Sink, Railroad Valley, and Columbus Marsh is inconclusive."

A plea for the increased use of lime, J. HENDRICK (*Trans. Highland and Agr. Soc. Scot., 5. scr., 26 (1914), pp. 218–232*).—This article discusses the extent to which liming is practiced at the present time in Scotland, as compared with its use in former times. It is shown that there has been a marked decline in the use of lime, and the reasons why lime should be more freely used are briefly stated.

It is estimated that the average loss per acre per annum in the drainage water throughout England and Wales is not less than 500 lbs. of calcium carbonate, the loss probably being much higher than this on manured soils. Reference is made to the fact that large quantities of carbonate of lime of excellent quality for agricultural purposes are annually produced in Scotland as a by-product from the causticizing plant of paper works, as previously noted (E. S. R., 30, p. 127).

Comparative field tests of this by-product and ordinary lime shells and gas lime are reported. The results show that the yields of turnips were largely increased by the use of each form of lime, the waste product being especially effective in this respect. It also apparently reduced the amount of finger-and-toe disease.

Agricultural lime analyses (*Md. Agr. Col. Quart. No. 64 (1914), pp. 8*).—Chemical analyses of samples of agricultural lime examined from June, 1913, to May, 1914, inclusive, are reported with brief notes on the use of lime. Mechanical analyses are also given of ground limestones and ground oyster shells.

Sulphur fertilizer for alfalfa, F. C. REIMER (*Pacific Rural Press, 87 (1914), No. 26, p. 717*).—Experiments in which flowers of sulphur, iron sulphate, superphosphate, and ground rock phosphate were applied to alfalfa at the rate of 300 lbs. per acre are reported. Largely increased yields where sulphur and sulphur compounds were used are reported.

The world's production and consumption of chemical fertilizers (*Production et Consommation des Engrais Chimiques dans le Monde. Rome: Inst. Internat. Agr., 1914, 2. ed., pp. XI+162, pls. 2*).—The first edition of this report has already been noted (E. S. R., 30, p. 223). This edition brings the statistics up to the end of 1912.

It is stated that the world's consumption of different classes of fertilizers for 1912 was as follows: Natural phosphates, 6,500,000 metric tons; superphosphates, 11,000,000; Thomas slag, 3,500,000; Peruvian guano, 83,000; potash salts, 4,520,959 (equivalent to pure potash, 904,000); sodium nitrate, 2,530,645; ammonium sulphate, 1,200,000, and synthetic nitrogenous fertilizers, 150,000 metric tons.

State fertilizer tonnage (*Amer. Fert., 40 (1914), No. 13, p. 96*).—A table is given which shows the consumption of fertilizers in the United States for the years 1909–1913, inclusive, "compiled from the most reliable statistics that are obtainable."

The figures for each State and Territory for 1913 are as follows: Alabama, 474,730 tons; Alaska, 45; Arizona, 600; Arkansas, 52,000; California, 36,000; Colorado, 3,500; Connecticut, 50,000; Delaware, 50,000; Florida, 213,728; Georgia, 1,120,693; Hawaii, 67,000; Idaho, 2,000; Illinois 90,000; Indiana, 193,899; Iowa, 3,500; Kansas, 7,380; Kentucky, 75,000; Louisiana 98,778; Maine, 160,000; Maryland, 169,000; Massachusetts, 125,000; Michigan, 57,985; Minnesota, 3,500; Mississippi, 128,050; Missouri, 60,000; Montana, 800; Nebraska, 1,000; Nevada, 800; New Hampshire, 25,000; New Jersey, 156,661; New Mexico, 1,000; New

York, 460,000; North Carolina, 840,447; North Dakota, 1,000; Ohio, 185,000; Oklahoma, 18,000; Oregon, 4,500; Pennsylvania, 340,000; Porto Rico, 18,836; Rhode Island, 18,000; South Carolina, 918,336; South Dakota, 700; Tennessee, 84,060; Texas, 75,500; Utah, 1,000; Vermont, 25,000; Virginia, 412,434; Washington, 1,500; West Virginia, 31,852; Wisconsin, 4,000; Wyoming, 200; total, 6,868,014 tons.

AGRICULTURAL BOTANY.

Plants and their uses, an introduction to botany, F. L. SARGENT (*New York, 1913, pp. X+610, figs. 384*).—This book is somewhat out of the ordinary in its plan. The author, after an introductory chapter on the study of plants, takes up and describes many species of common usage, grouping them under the headings of cereals, food plants, flavoring and beverage plants, medicinal and poisonous plants, and industrial plants. Chapters are also given on classification and descriptions of the general features of many of the more common plant groups, with discussions on the relations and adaptation of plants, life history, etc. This method, which the author calls the historical method, is thought to be adapted to teaching botany, as it not only helps the beginner to learn at the outset as much about these economic plants as he is ready for, but helps him to classify them scientifically. He will thus be prepared to appreciate the wider view of the life of plants which inspires botany today.

Some honey plants of Guam, J. B. THOMPSON (*Guam Sta. Rpt. 1913, pp. 21, 22*).—Notes are given on some of the more common honey plants occurring in Guam.

Some new tuberous species of Solanum, L. WITTMACK (*Bot. Jahrb. [Engler], 50 (1914), Sup., pp. 539–555, figs. 3*).—Work previously reported (E. S. R., 22, p. 435) on species of Solanum has been continued, and the author herein gives a description with brief discussion of six tuberous forms from Argentina claimed to be new species and named respectively *S. neoweberbaueri*, *S. kurtzianum*, *S. vernëi*, *S. velascanum*, *S. famatinæ*, and *S. æmulans*, the name of Dr. Bitter being added to that of the author in connection with all but the first named species.

A study of the vegetation of the sand hills of Nebraska, R. J. POOL (*Minn. Bot. Studies, 4 (1914), pt. 3, pp. 187–312, pls. 16, figs. 16*).—This thesis gives the results of an ecological study of the sand hill region which occupies a considerable portion of the northwestern part of Nebraska. After discussing the geological and topographical features of the region and the general plant life conditions, the author describes at length the different plant formations and their relations and successions. A bibliography is appended.

Sand plants on lime soils, M. BÜSGEN (*Bot. Jahrb. [Engler], 50 (1914), Sup. pp. 526–538, pls. 2*).—In tests with *Sarothamnus scoparius* and *Digitalis purpurea* on both sandy and limy soil it was found that a good start was made by both plants, but that on limy soil weakening was early apparent in connection with chlorosis. *Calluna vulgaris* showed a decided difference in favor of the sandy substratum as regards development. *Lupinus luteus* is said to have shown no preference between sandy and siliceous soils at first, but finally an increase of 50 per cent in weight in favor of sandy soil. *S. scoparius* in either soil showed no particularly high percentage of lime. It is suggested that the utilization of other elements may have been influenced by the calcium content in these experiments.

A quantitative chemical and physiological study of nutrient solutions for plant cultures, W. E. TOTTINGHAM (*Physiol. Researches, 1 (1914), No. 4, pp. 133–245, figs. 15*).—The author reports an investigation made to study the influence upon the growth of young wheat plants of a wide range of proportions

of the component salts in nutrient solutions and the alterations of this influence produced by different total concentrations.

Preliminary to the investigation a study was made of methods for preparing Knop's nutrient solution. The wheat seedlings were started in water, after which they were grown for 24 days in the above solution containing various concentrations of potassium phosphate, magnesium sulphate, calcium nitrate, and potassium nitrate. It was found convenient to employ the component salts of Knop's formula in stock solutions, one part containing only the calcium nitrate and the other part the remaining three salts. Methods for germinating seeds and mounting seedlings in culture solutions, which were somewhat different from those usually employed, were devised and are described.

The most important factor found to affect the physiological influence of varying proportions of the four salts in the culture solutions was apparently the ratio of the magnesium content to that of calcium. The injurious effect of magnesium and the amount of dry matter produced by the plants were found to depend upon the complex balance between all the salts in solution. The effects upon growth of any given set of proportions of nutrient salts in the medium varied with the total concentration of the medium.

A bibliography is given.

The functions of nutritive materials in higher plants, K. Faack (*Mitt. Landw. Lehrkanz. K. K. Hochsch. Bodenkul. Wien, 1 (1913), No. 4, pp. 443–509, fig. 1*).—Results are given in considerable detail of studies carried out with wheat plantlets as affected by solutions of salts containing nitrogen, carbon, potassium, iron, phosphorus, and sulphur employed separately, and also as furnished simultaneously by placing portions of the rootlets of a given plantlet in different media. It is thought that the nutritive substances necessary to growth must be first combined in and by the plant body itself after being taken up separately in the transpiration current, since passage from root to root is excluded by the arrangement described.

A short bibliography is appended.

A review of recent investigations on the mineral nutrition of fungi, A. W. Dox (*Biochem. Bul., 3 (1914), No. 10, pp. 222–238*).—A critical review is given of recent literature pertinent to the nutrition of fungi, most of the articles having appeared within the last two years.

The carbon nutrition of plants, P. Ravin (*Ann. Sci. Nat. Bot., 9. ser., 18 (1913), No. 5–6, pp. 289–451, figs. 24*).—A study is reported on the carbon nutrition of radishes grown in Knop's solution, to which were added various organic acids and organic acid and neutral compounds of potassium. The effect of the different compounds on turgescence, respiration, increase in fresh and dry weight, and ash content is shown.

In addition to radishes, the study was supplemented with investigations on the carbon nutrition of some algæ and fungi. For the higher plants it was found that they absorbed and assimilated succinic, malic, citric, tartaric, and probably oxalic acids. The order in which they are mentioned is in a decreasing proportion as to their nutritive action or an increasing ratio of toxicity. If two organic acids, one in a free acid state and the other in the form of a corresponding salt, are added to solutions, the free acid is found more toxic and less nutritive than its corresponding salt.

Some physiological differences were noted in the behavior of the various groups of plants. Phanerogams were found to utilize indiscriminately the free organic acids and their various potassium compounds. Algæ, which are very susceptible to acids, assimilated only the neutral salts of potassium. The molds utilized the organic acids, but not all the organic acid salts.

An extensive bibliography is given.

Gaseous exchanges and variation of sugars and glucosids during formation of anthocyanin in flowers of Cobæa scandens, E. Rosé (*Compt. Rend. Acad. Sci. [Paris], 158 (1914), No. 13, pp. 955–958*).—Reporting a study of this flower in its four stages of development, the author states that in the corolla of flowers kept in darkness the intensity of respiration reaches a maximum in the bud stage, decreasing progressively thereafter. The ratio of carbon dioxid given off to oxygen absorbed is nearly constant (lying between 96 and 99 per cent) during floral development, the intensity thereof being less than that of the reverse exchange in light during nearly the whole of this period, and the two approximating equilibrium at floral maturity. Considerable oxygen is taken in at all times by the petals in both white and colored flowers. Pigments in colored petals showed a general relation to light intensity analogous to that noted by Combes (E. S. R., 23, p. 528). In the first three stages (budding, greening, and reddening) the total amount of sugars increases, decreasing, however, in the fourth (violet) stage, in which glucosids increase. It is thought that anthocyanin is formed independently of the preexistence of glucosids, but that the total amount of glucosids present in the petals is related to the presence of anthocyanin therein.

Researches on the physico-chemical properties of vegetable saps. II, J. A. Harris and R. A. Gortner (*Biochem. Bul., 3 (1914), No. 10, pp. 196–201, pl. 1*).—In continuation of a previous paper (E. S. R., 28, p. 821), the authors give an account of a study of the physico-chemical constants of the juice of apples and pears of varying size and fertility. Comparisons are also made with the fruit of Cercis and Staphylea.

Summarizing their results, the authors state that in all four cases there is a correlation between the size of the fruit and the number of seeds which it produces. It is thought probable that the relationship is a direct causal one and that the size of the fruit is influenced by the number of seeds rather than conversely. It has been considered that the development of the seed influences the properties of the sap in the development of the fruit, but the authors were unable to demonstrate any sensible differences in the osmotic pressure, mean molecular weight, or electrical conductance of the saps of nearly ripe fruits of different sizes or producing different numbers of seeds.

A review of Willstätter's researches on chlorophyll, C. J. West (*Biochem. Bul., 3 (1914), No. 10, pp. 229–258*).—This is a review of a recent book entitled Untersuchungen über Chlorophyll, by R. Willstätter and A. Stoll, together with numerous articles by Willstätter in other publications.

Study of the constitution of plastids, in particular as regards the presence of lipoids and the photosynthetic function of the chloroplasts, L. Buscalioni (*Bot. Jahrb. [Engler], 50 (1914), Sup., pp. 657–672*).—Plants of about 150 species representing different families were kept under controlled conditions for one year and examined at intervals of about one month.

It is stated, among other findings, that lipoids were present almost universally in the green plastids of the cells in case of the older leaves, much less frequently in the younger ones.

Reply to Kostytschew's articles on respiration of wheat seedlings, W. Zaleski (*Ber. Deut. Bot. Gesell., 32 (1914), No. 1, pp. 87–90*).—This is a reply to an article by Kostytschew and Scheloumoff and one by these authors and Brilliant (E. S. R., 30, p. 522).

The action of anodic and cathodic solutions on germination, H. Micheels (*Acad. Roy. Belg., Bul. Cl. Sci., 1913, No. 9–10, pp. 831–887, fig. 1; abs. in Jour. Chem. Soc. [London], 106 (1914), No. 616, I, p. 239*).—Experiments are reported on the germination of wheat in the anodic and cathodic compartments of an electrolytic cell containing from 0.001 to 0.01 molecular concentration of sodium

or potassium chlorids. The effect of the electrical treatment as shown by the percentage of germination, length of first leaf, length of roots, and increase in weight was determined.

The author claims that the effect on germination in a given solution is approximately proportional to the quantity of electricity which has been passed through the solution in which the germinating seeds are placed. It is said that the differences between the cathodic and anodic effects can not be accounted for on the basis of the alkali and acid which are formed as a result of secondary decomposition. The feeble development of the roots in the anodic solution is attributed to the coagulation of the colloidal solution under the influence of the cations which readily pass through the membrane of the root cells.

Some recent experiments in the application of electricity to plant production, J. H. PRIESTLEY (*Gard. Chron., 3. ser., 55 (1914), Nos. 1424, pp. 245–247, figs. 3; 1425, p. 271, figs. 3*).—Recent experiments carried out with potatoes at Garforth and at Dumfries are claimed to show (1) that results of work as heretofore reported by some investigators probably require revision on account of the recent discovery of the large part played by wind in carrying the charge to control plats, and (2) that screens surrounding electrified areas must be higher, the carrying wires lower, and the plats more completely isolated by screening and by location with reference to prevailing winds. Results from experiments under improved conditions in 1913 are thought to have been vitiated by the extreme dryness during much of the growing season, but it is expected that more accurate and instructive results may be obtained from the work as planned for the present season.

FIELD CROPS.

Irrigation and manuring studies, F. S. HARRIS (*Utah Sta. Bul. 133 (1914), pp. 383–418, figs. 6*).—The effect of irrigation on yield of grain and stover was such that "during 1911 and 1912 the highest yield of grain was obtained with 30 in. of irrigation water, while in 1913, and as an average of the 3 years, 20 in. gave a higher yield than any other amount of water. In every case the yield was lower where 40 in. of water were given during the season than where less was applied. The stover yield was greatest in 1911 with 40 in. of water, in 1912 with 30 in., and in 1913 with 20 in." For each inch of irrigation water the yields of grain for 5, 10, 20, 30, and 40 in. were respectively 1.12, 0.46, 0.59, 0.33, and 0.26 bu. per acre. Over four-fifths of the crop was produced by the natural precipitation.

The effects of manuring at the rates of 5 and 15 tons per acre are noted as evident in connection with the irrigations, even on rich soil. "During the first year of the test the yield was raised from 55 to 74 bu. by 15 tons of manure. By comparing the yields of 1911 with those of 1913 it will be noted that the manured plats maintained their original yields of grain, while the yields on the unmanured plats decreased considerably. . . . During the first year of manuring there was a greater increase in yield for each ton of manure where 15 tons were added than where 5 tons were added. During the other years, however, the manure was used more economically with a light than with a heavy application. The figures show that all the value of the manure is not used during the first season, but that it has a residual effect. The average of all treatments show that for each ton of manure applied the yield per acre was increased by 2.32 bu. of grain and 396 lbs. of stover. The manure would, therefore, have a money value to the farmer of something like $2 per ton during the first year, besides improving the soil for future crops." As a result of

the study of the effect of the manurial treatments in connection with irrigation on the different parts of the plant, it is noted that "the average results for three years show that the relative amount of stover gradually increased with the moisture. There was, however, a very slight falling off when 40 in. of water were used."

In regard to the ratio of grain to cob it was found that "the water applied did not affect the ratio of grain to stover as much as did the manure. On the average the proportion of grain to cob was increased by manure. An increase is also noted with the application of more water, but the difference is slight. The season seems to be the chief factor affecting the ratio." Data show that "the irrigation water did not have any consistent effect on the weight of 1,000 kernels from year to year, but manure increased the weight of kernels in every case. One year's test on the weight of a measured bushel of grain showed it to be heaviest with a medium amount of water. The grain on manured plats was heavier than on the unmanured, and 5 tons of manure gave slightly heavier grain than 15 tons. . . .

"As an average of the three years, the greatest yield [of leaves] per plat was secured when 20 in. of water were applied. In 1912, however, the highest yield was secured with 30 in. The effect of the manure was more marked on the yield of leaves than it was on the yield of total stover or of grain. About twice as many leaves were produced on plats with 15 tons of manure to the acre as on the unmanured plats." Data also show the effects of the treatments of manure and water on yield of stalks, husks, and cobs, which do not seem to be very marked, especially in regard to water.

"Large amounts of irrigation water cause the corn to have relatively less grain, cobs, and leaves, and more husks and stalks. Manure decreased the percentage of grain, cobs, and husks in the plant, but increased the percentage of stalks and leaves. Soil treatments affected the branching of the corn tassels in the same manner that they affected the production of ears. The time of maturity of corn was delayed by irrigation, but hastened by manure. This is important, since earliness in maturity of corn is very desirable in Utah. The germination of corn was most rapid and complete in a soil containing a medium amount of soil moisture. The number of stomata on a given area of leaf surface was increased by a large amount of soil moisture. This probably causes wastefulness in transpiration. The proportion of roots to tops was increased by lowering the soil moisture. When deep rooting is desired, overirrigation should, therefore, be avoided."

Many tabulated data are included.

Minor dry land crops at the Nephi Experiment Farm, P. V. CARDON (*Utah Sta. Bul. 132 (1914), pp. 349–378, figs. 7*).—This bulletin gives results of trials of crops other than cereals.

Both in the production of seed and hay alfalfa planted in hills 18 by 24 in. apart proved very successful, yielding heavier than several other methods tried. An alfalfa nursery, consisting of 48 selections, is under observation.

Thus far sweet clover and vetch are noted as being of little value under these dry land conditions. *Agropyron occidentalis*, *Bromus inermis*, *B. uniloides*, and *Avena elatior* were of little value as forage crops. Work, which is being continued, with grain sorghum, broom corn, and sugar beets has not yet given satisfactory results.

Drilling corn in rows 3 ft. apart with an ordinary grain drill proved the most profitable method of planting this crop on heavy lands. Several varieties of field peas are reported as being satisfactory, yielding from 384 to 737 lbs. of seed per acre.

Results of variety and cultural tests with potatoes show that "25 varieties of potatoes have been tested since 1908 and most of these have given fair yields during that time. The variety White Peerless has proved most satisfactory from the standpoint of both yield and keeping qualities. The cultural tests with potatoes indicate that sets placed about 24 in. apart in rows 3 ft. apart will give the best results. The depth of planting seems to depend upon the condition of the soil at planting time." Potato yields ranged from 4 to 138 bu. per acre. The source of seed, whether dry-land or irrigated, seems to have little effect on the yield. Small seed was better than large seed, and freshly cut seed slightly better than calloused seed.

The Clermont County experiment farm (*Ohio Sta. Bul. 275 (1914), pp. 309–316*).—This report gives an outline of the general plan of management and results of fertilizer tests in rotations with corn, soy beans, wheat, and clover; of variety tests with corn and oats in 1913; and some results of a 5-year rotation conducted for 20 years at Wooster.

In regard to the fertilizer treatments in a 4-year rotation at Clermont it is noted "that the treatment has produced an immediate and marked increase in yield, and that the complete fertilizer, containing nitrogen as well as phosphorus and potassium, has produced not only the largest total increase but also the largest net gain, notwithstanding the greatly increased cost of the fertilizer."

The Miami County experiment farm (*Ohio Sta. Bul. 274 (1914), pp. 289–307, figs. 2*).—This is a report of progress (E. S. R., 29, p. 31), and gives data on rotations and fertilizer experiments that include corn, oats, wheat, clover, soy beans, and tobacco; variety tests with corn, wheat, oats, tobacco, and soy beans; and feeding trials with pigs (see p. 471).

The data show a much reduced yield the third year on land growing corn continuously as compared with land cropped in rotation. The fertilizer tests indicate a need of potash and phosphorus.

The Paulding County experiment farm (*Ohio Sta. Bul. 273 (1914), pp. 278–288, pls. 2*).—This is a report of progress (E. S. R., 29, p. 137) and gives data on fertilizer tests in rotations that include corn, oats, wheat, clover, soy beans, and sugar beets, and results of variety tests of wheat, corn, oats, and soy beans for 1913.

Report on grass seed mixtures, 1907–1913, W. M. Findlay (*North of Scot. Col. Agr. Bul. 18, 1914, pp. 75*).—From grass seed mixtures sown at many centers the following conclusions were drawn:

"There was no direct relation between the weight of hay produced and the quantity of perennial rye grass sown. A small quantity (say ½ bu.) of seed of perennial rye grass produced nearly as much of this grass in the hay as a larger quantity (1½ bu.). This was due to the greater stocking power and to the stalks being bigger. When a large quantity of perennial rye grass was used, the pasture, during the second and third years, was neither abundant nor prolonged, and pluff grass was encouraged. Neither a small nor a large quantity of Italian rye grass, as part of a seed mixture, increased the hay crop. When the conditions suited it, it competed too severely against red clovers; when the conditions did not suit it, the quantity in the hay was very small.

"The quantity of cocksfoot and timothy in both hay and pasture was increased by increasing the seeding (up to a certain point) and by reducing the quantity of perennial rye grass. Meadow fescue was not able to compete against rye grass the first year or against cocksfoot and timothy the second year. Tall oat grass tended to increase the hay crop, but was not a success in the pasture. Rough-stalked meadow grass had no influence on the hay. Although the plants were small, they helped to fill up spaces in the pasture.

Crested dogtail was present in small quantities in the first and second seasons, but increased considerably by the third. Cattle, however, did not relish the herbage on the plats where it was included. Late-flowering red clover produced more hay than any other kind, but tended to suppress the grasses. On land where white clover did not grow naturally wild white clover was much superior to ordinary white."

Fodder grasses of Java, III–IX, C. A. BACKER (*Teysmannia, 24 (1913), Nos. 5, pp. 314–320, pls. 3; 6, pp. 366–377, pls. 2; 7, pp. 423–437, pls. 2; 8–9, pp. 495–511, pls. 5; 10, pp. 633–644, pl. 1; 11–12, pp. 721–729, pls. 2; 25 (1914), No. 2, pp. 81–88, pls. 3*).—In these articles, containing previous work (E. S. R., 30, p. 525), are described *Paspalum scrobiculatum, P. longifolium, P. conjugatum, P. platycaulon, P. distichum, P. sanguinale, P. roylcanum, P. minutiflorum, P. brevifolium, Eriochloa ramosa, Isachne australis, I. albens, I. kunthiana, I. pangerangensis*, and *I. firmula*, and their value as fodder plants for Java are discussed, including chemical analyses in some cases.

The chemical composition of South African maize and other cereals, C. F. JURITZ (*Agr. Jour. Union So. Africa, 6 (1913), Nos. 2, pp. 189–197; 3, pp. 495–501, fig. 1; 5, pp. 806–811*).—The chemical composition is reported of numerous varieties of oats, wheat, barley, and maize grown in several Provinces in South Africa, with a special discussion of the content of phosphoric acid.

Influence of suppressing the inflorescence on the sugar content of cane and maize, DECOCK (*Bul. Agr. Algérie, Tunisie, Maroc, 20 (1914), No. 4, pp. 123–127*).—Results are given which show no change or only a slight decrease in sugar content when maize plants were detasseled, while by heading cane the sugar content was in some cases increased nearly 3 per cent.

Composition of maize at various stages of its growth, W. J. JONES, JR., and H. A. HUSTON (*Indiana Sta. Bul. 175 (1914), pp. 599–630, pl. 1, figs. 12*).—This bulletin gives results of chemical analyses of maize made at seven stages of growth.

These results showed that "every ingredient continues to increase uniformly until October 1, and with the exception of potash until October 8. . . . The dry matter, crude fiber, fat, nitrogen-free extract, and starch in the stalks, blades, and husks remain practically constant while they increase rapidly in the ear. The potash increases regularly in the ear, but is depressed in the vegetative parts from August 28 to September 24. This may be due to washing out of potash from the leaves, since there were repeated rains during this period, or it may have been due entirely to transfer to the ear. The potash in the whole plant continued to increase till October 1. On October 2, 4, and 7 heavy rains occurred, which probably account for the marked reduction of potash in both stalks and ears between October 1 and 8.

"The total ash increased regularly in both stalks and ears. After the ear begins to form the nitrogen decreases quite regularly in the stalk, from 53.5 lbs. per acre on August 28 to 31.8 lbs. per acre on October 8, although the nitrogen in the whole plant was rapidly increasing. The amount of amid nitrogen in the ears is too small to be satisfactorily illustrated by curves. But one of the most striking facts shown by the analyses is that the nitrogen in the ear, even in its earliest stages, is practically all in the form of real albuminoids, the amount of amid nitrogen in the ears never exceeding 1.5 lbs. per acre.

"The amount of amid nitrogen in the vegetative parts of the plants decreased from 10.7 lbs. per acre on August 28 to 4.5 lbs. on October 8. No starch was found in the preliminary period, and even at the time when the formation of the ear began, August 28, there were only 335.3 lbs. of actual starch per acre. . . .

"The sharp rise in the potash curve during the period of greatest starch formation, September 24 to October 1, is highly significant. Undoubtedly many maize fields fail to give a satisfactory yield of grain because of a lack of available potash at this period. This lack may be due either to a deficiency of available potash in the soil or to a lack of moisture to bring it to the plant. It is therefore advisable to provide a reasonable supply of available potash if we expect a full formation of starch in the maize. Without complete formation of starch the maize is what is known as 'chaffy.' The same remarks apply to the desirability of furnishing a suitable amount of available phosphoric acid.

"It is to be noted that in this investigation the maize plant, when supplied with a proper amount of water at regular intervals by irrigation, took up about the same amount of phosphoric acid, about 35 per cent more nitrogen, and more than twice as much potash as the authorities usually state that the crop contains."

A large colored chart showing the composition of the plant at five stages of growth is included.

Corn culture, J. M. KIMBROUGH (*Georgia Sta. Bul. 104 (1914), pp. 17–30, fig. 1*).—The results of variety tests with 19 varieties of corn grown in 1913 show an average yield of 36.35 bu. of shelled corn per acre as compared with a little over 15 bu. as a state average in 1912. The best yielder was Weekley Improved, averaging 51.79 bu. per acre.

In a fertilizer test in which the formulas were made to carry equal amounts of nitrogen, sulphate of ammonia at the rate of 99.4 lbs. per acre apparently gave better returns than cotton-seed meal, nitrate of soda, or dried blood as the average of a 4-year test, although nitrate of soda gave slightly the best yield for 1913, followed by sulphate of ammonia, nitrate of lime, dried blood, and cotton-seed meal. In a comparison of cotton-seed meal (285.6 lbs.) and dried blood (189.6 lbs.) the yields per acre were identical.

Better results are shown to have been obtained by applying a complete fertilizer at the time of the second cultivation of the corn than before planting. Subsoiling by the use of dynamite was followed by a yield of 30.35 bu. per acre as compared with 34.3 bu. on soil not dynamited. Applications of complete fertilizers from 200 to 600 lbs. per acre in 100-lb. degrees gave gradually increased yields of corn, but not sufficient to cover costs when more than 200 lbs. was applied.

Corn growing in Washington, G. SEVERANCE (*Washington Sta. Popular Bul. 60 (1914), pp. 14, fig. 1*).—A revision of Popular Bulletin 38 (E. S. R., 25, p. 531).

On cotton cultivation, J. M. KIMBROUGH and R. J. H. DELOACH (*Georgia Sta. Bul. 105 (1914), pp. 33–47, figs. 2*).—In a test of 20 varieties it was found that "the Cleveland Big Boll stands at the head of the list again, with a total yield of 2,852 lbs. of seed cotton per acre."

In fertilizer tests to study the relative efficiency of nitrogen in cotton-seed meal, dried blood, nitrate of soda, sulphate of ammonia, and nitrate of lime in a 9:3:3 formula for cotton, it was found that "on account of the falling off in the yield of the sulphate of ammonia plats in 1913 the five years' average was less with this source of ammonia than with nitrate of soda. The four years previous to this favored the use of sulphate of ammonia." A comparison between cotton-seed meal and dried blood resulted slightly in favor of the latter in yields of 1,754 and 1,852 lbs. seed cotton per acre, respectively. With muriate of potash a yield of 1,679 lbs. was obtained as compared with 1,429 lbs. with kainit.

Dynamiting the land to a depth of 2½ to 3 ft. apparently produced an increase in yield of seed cotton over undynamited land of 126 lbs. per acre.

Brief directions for farm selection of cotton seed to improve the crop are given.

The feeding of cotton, H. C. WHITE (*Georgia Sta. Bul. 108 (1914), pp. 129–144*).—This bulletin gives results of four years' investigation of the composition of the cotton plant at four stages of development during the seasons of 1910–1913, inclusive.

Determinations were made of the nitrogen, phosphorus, sulphur, potassium, calcium, magnesium, ash, and dry matter content for each period.

"Notwithstanding the seasonal differences, which were such as usually obtain in this region, the results for the four successive years exhibit marked agreement. The weight of dry matter of the plant in different periods varied somewhat from year to year, as did also the yield of crop. But the feeding habit of the plant for the mineral foods remained approximately uniform. In only one case is a somewhat wide divergence shown—that of sulphur in 1913. . . .

"Stated roughly, approximately one-third of the total plant food is taken during the first period of 30 days in the life of the plant, terminating with the setting of the first form; a second third is taken during the second period of 30 days terminating with the formation of the first bloom; by the termination of the third period of 60 days, with the opening of the first boll, 85 to 90 per cent will have been taken, leaving only 10 to 15 per cent to be added during the ripening and maturing period of 90 to 100 days. Of the total dry matter of the plant, however, approximately only one-eighth is produced during the first period; another eighth during the second period; one-fourth during the third period; and one-half during the maturing period.

"It may be stated that examination of plants grown in the usual manner in rows 4 ft. apart and plants 12 to 16 in. apart in the row, the cultivation and fertilization being as above recorded, gave results in general agreement with those above reported. The main differences were in the amount of dry matter produced, that is, the weights of the individual plants, which were generally less for the closely spaced plants than for those more widely apart."

A new system of cotton culture and its application, O. F. COOK (*U. S. Dept. Agr., Farmers' Bul. 601 (1914), pp. 12, figs. 2*).—A description of this new system of cotton culture, which is based upon the principle of controlling the formation of the branches, has already been noted (E. S. R., 28, p. 832).

Results of additional experiments show an increase in yield due to the new system of 35 per cent in the first picking and 26 per cent in the second picking. No adverse effect on the lint was observed.

The classification and grading of cotton, D. E. EARLE and W. S. DEAN (*U. S. Dept. Agr., Farmers' Bul. 591 (1914), pp. 23, figs. 16*).—This describes the standard grades of cotton established by this Department, with suggestions as to cotton handling and grading.

As factors influencing the grade of cotton, leaf, dirt, sand, motes, neps, gin-cut or stringy fiber, cut seed, and color are discussed. Directions for grading samples by comparing with official standards are given, likewise a comparison of American and European standards. Grade characteristics of Gulf, Upland, and Texas growth, and the relative values of different grades and different lengths are also discussed.

Helianthus, M. RAU (*Illus. Landw. Ztg., 34 (1914), No. 21, pp. 209, 210*).—In giving results of comparative tests the author shows the artichoke to be superior to the potato as a forage crop, as it requires less labor to plant and cultivate, yields more heavily in tubers and straw, is of higher food value, and the tubers have a greater frost resistance.

Grown on adjoining plats and with similar cultural treatment artichokes and potatoes analyzed as follows: Water 74.48 and 71.52 per cent, fat 0.08 and 0.12,

protein 1.84 and 2.53, nitrogen-free extract 22.09 and 23.11, crude fiber 0.52 and 1.17, and ash 0.99 and 1.55 per cent, respectively.

A rapidly growing new forage plant, M. DENAIFFE and J. COLLE (*Jour. Agr. Prat., n. scr., 27 (1914), No. 10, pp. 300–302, fig. 1*).—This describes *Lolium multiflorum* and gives results of cultural tests in which this grass yielded 4,880 kg. per hectare (4,343 lbs. per acre) in comparison with 3,200 kg. of Italian rye grass and 3,200 kg. of English rye grass.

Chemical analysis shows it to contain less cellulose and more ash than the other two grasses.

Oats for New York, H. H. LOVE (*New York Cornell Sta. Bul. 343 (1914), pp. 363–416, figs. 19*).—This bulletin reports work in cooperation with the United States Department of Agriculture with strains of hybrids, selections, and commercial varieties of oats grown at Cornell in 1911–1913. Some methods and apparatus used in the field and laboratory are described. Tables give yields in bushels per acre, together with gain or loss over the check variety, yields of straw, ratio of straw to grain, weight per bushel, percentage of meat, and weight per 100 kernels.

In regard to transmission of high yield it is noted "that many of the strains under test are not constantly high-yielding. There are some strains, however, which are always among the best in yield."

Some correlations of characters of oats as developed in these tests are noted as follows: Correlation coefficients between a yield of straw and yield of grain for the 3 years, 1911–1913, "are 0.357±0.082, 0.714±.03, and 0.5±0.043, showing that there is a very good correlation between the two characters in question." "When all the varieties that have been grown in 1912 and 1913 are considered, it is found that weight per bushel is correlated with yield per acre. The coefficients for the two years are 0.442±0.05, and 0.533±0.041. . . . The length of kernel was correlated with weight per bushel for the two years 1912 and 1913, and the correlation coefficients were found to be −0.221±0.059 and −0.5±0.043, respectively. In other words, as the kernels become longer the weight per bushel became less. The varieties having a long kernel, in general, have a smaller weight per bushel than those having a shorter kernel.

"The breadth of kernel was divided by the length in order to find the ratio between the two characters. The kernels that were broader in comparison to their length would have a higher ratio. This ratio was then correlated with weight per bushel for the two years, and the correlation coefficients were found to be 0.751±0.027 and 0.626±0.035, respectively, thus indicating that those varieties possessing kernels with greater breadth in comparison to their length gave a higher weight per bushel."

"The highest percentages of meat are obtained from those varieties having a comparatively small kernel. Of 19 varieties having a percentage of meat of more than 70, all but 4 have a kernel weight of less than 2.5 gm. per hundred; while of the 7 varieties whose percentage of meat is 65 or less, 4 have a kernel weight of over 3 gm. This indicates that there is no relation between large kernels and high percentage of meat in the sense that the two are found together.

"All the varieties studied for 1912 and 1913 were arranged in correlation tables with respect to the two characters, weight per hundred kernels, and percentage of meat, and there was found a negative correlation of −0.237 ±0.058 and −0.188±0.055. These coefficients are not large, and when one considers their probable errors they are not conclusive other than for the fact that they are negative both years. This indicates that if any relation exists between these characters it is in the direction that large seeds would tend to have a thick hull and therefore a low percentage of meat. For the condi-

tions under which these oats were grown the small- or medium-seeded strains are the more desirable.

"These studies indicate, further, that the varieties tending to produce large quantities of straw give, on the other hand, a large quantity of hull and a comparatively small quantity of meat. The correlation between percentage of meat and yield of straw for the varieties grown in 1913 gave a correlation coefficient of -0.621 ± 0.035, showing that as the yield of straw increased there was a decrease in percentage of meat. The correlation between length of kernel and percentage of meat was also determined, in order to see whether long kernels gave more meat than short ones. The correlation coefficients were found to be -0.108 ± 0.061 and 0.04 ± 0.057 for the two years, thus showing that there was no relation between length of seed and amount of meat. Correlation tables were made on the percentage of meat and weight per bushel, but no correlation was found. . . . The weight per hundred seeds was correlated with the yield for each of the years 1912 and 1913, and the correlation coefficients for the two years are 0.347 ± 0.054 and 0.23 ± 0.054. So far as these coefficients are concerned, while they are not conclusive, there is a tendency for the large seed to be associated with large yield."

It is noted in conclusion that some of these hybrids and selections, "such as Silvermine selections 120–9 and 125–20, Welcome selection 123–5, and the Garton Tartar King×Clydesdale hybrid 27a1–31, have proved to be of value for New York State.

"Place variation tends to operate to such an extent that variety tests should be continued over several years before definite conclusions may be drawn. The later oats, such as the Lincoln or the Silvermine type, have given better results for this locality than have the early oats, such as Sixty Day. The results show that the yield of straw tends to follow closely the yield of grain, and that varieties producing heavy yields of straw usually produce low quantities of meat. The ratio of grain to straw seems to be rather constant from year to year. The weights per bushel for the different years for the same varieties are comparatively high or low, as the case may be.

"Weight per bushel depends considerably on the shape of the kernels. A high weight per bushel does not necessarily mean a high-yielding variety. The weight per hundred kernels was found to vary greatly for the different varieties. There is a slight tendency for heavy-yielding varieties to have larger seed. The percentage of meat differed greatly for the different varieties. Certain varieties give such a low amount of meat that they should not be grown at all commercially."

Some varieties and strains of oats and their yields per acre in South Dakota, A. N. Hume and M. Champlin (*South Dakota Sta. Bul. 149 (1914), pp. 347–372*).—Classifications and descriptions are given based upon color, time of maturity, and shape of panicle. Tables report the yield of several varieties grown during 1906–1912, inclusive.

Sixty Day, Swedish Select, North Finnish Black, and Red Algerian were among the best yielders, producing from 23.2 to 43.5 bu. per acre.

Potato growing in Washington, O. M. Morris, J. G. Hall, and M. A. Yothers (*Washington Sta. Popular Bul. 62 (1914), pp. 37, figs. 18*).—Cultural notes, including especially methods of treatment for diseases and insect pests.

The effects of defoliation and the application of nitrates on the composition of the sugar beet, W. P. Headden (*Proc. Colo. Sci. Soc., 10 (1914), pp. 415–429*).—This reports a study subordinate to that previously noted (E. S. R., 28, p. 43).

It is noted that "the defoliation has very radically affected the assimilation and metabolism of the nitrogen compounds in the beets. This is most marked

in the case of the nitric nitrogen, the form in which the plant supposedly takes up its nitrogen supply. In the case of the variety ER the nitric nitrogen in the beet on September 1 was 0.01925, in the normally developed beet on November 8, 0.00827, in the defoliated beets on November 8, it was 0.01367. There is an actual depression in the percentage, but it is not equal to that required to be proportional to the increase in the weight of the beets; in other words, there has been an increase in the amount of nitric nitrogen in these beets instead of a decrease as there was in the normally developed beets, and as there had been in those which had received an application of nitrates up to September 28. The total nitrogen in the beets of the variety ZR harvested November 8 is very low and the nitric nitrogen very high. In this variety we find the size of the beets depressed and the percentage of sugar no higher than it was on September 1 immediately prior to defoliation.

"The amount of mineral matter taken up by the crop of defoliated beets is less than that taken up by the normally developed crop, but the ratio or percentage is scarcely disturbed at all. The most striking feature is perhaps the phosphoric acid, which is the same in the normally developed and the defoliated beets, while it is decidedly depressed in the nitrate beets.

"The complete defoliation of the beets on September 6 caused the production of smaller roots than were produced in the case of the same varieties with normal development. The roots were poorer in dry matter and in sugar than the normally developed beets. These results are in harmony with those previously observed. The effects upon the nitrogen in the beets was to suppress the total amount, but it caused an increase in the nitric nitrogen present in the root while this form was materially reduced (50 per cent) in the normally developed beet. The proteid nitrogen was also depressed, showing that both the intake and assimilation of the nitrogen had been involved.

"The effects of defoliation upon the ash constituents was proportional to the effect upon the size of the roots or crop, and affected the composition of the ash but slightly, or not at all."

It is noted that the attack of the fungus *Cercospora beticola*, which often defoliates beets, produces a similar effect on the resultant crop.

Tabulated data of analyses of various parts of the beet plant are given.

Sweet potatoes: Culture, storing, and studies in fertilizing, H. P. Stuckey (*Georgia Sta. Bul. 107 (1914), pp. 81–112, figs. 24*).—In this bulletin cultural methods are given which include soil preparation, bedding the seed potatoes in hotbeds and in the open, time and method of setting the plants, methods of keeping and storing sound potatoes, and directions for the construction of a storage house.

Tests of planting dates show a period from May 16 to June 11 to be most favorable for large yields.

Better yields were obtained from pieces of vine about 14 in. long set July 28 in comparison with plants, yields being 36 and 7 lbs., respectively on 1/52 acre plats. Pruning the vines to about 1 ft. in June reduced the yield nearly one-half. Home-grown plants yielded considerably better than commercial plants shipped in from other localities.

Data on the date of digging show that there was a decided financial loss on the Golden Beauty potato by early digging and a gain on the Enormous. "This just emphasizes the necessity of knowing the stage of maturity of the potatoes and the price the market offers for the crop before an early harvest is made." A test of 17 varieties showed a wide range in yields (126.6 bu. to 474.6 bu. per acre) based upon varietal characteristics, the heavy yielders being chiefly of stock feeding quality.

The use of formalin and Bordeaux mixture did not prevent decay of potatoes in storage.

Yields in fertilizer tests are given for the years 1908–1913, inclusive, but indicate that variations due to seasonal conditions are often as great as those due to fertilizer. "Stable manure alone apparently gave a heavy crop of vines and a heavy crop of potatoes, while nitrate of soda alone gave a heavy crop of vines, but a light crop of potatoes. The size and length of the vines, the size and length of the leaf petioles, and the size of the leaves were much greater on those plats receiving nitrogenous fertilizers."

In a study of the cell structure of the vines from different plats it was found that "cross sections of those vines grown on plats receiving heavy applications of nitrogenous fertilizers showed about the same number of cells, but of much larger size than the vines from plats receiving nonnitrogenous fertilizers. The vascular ducts in the vines from the plats receiving nitrogenous fertilizers were also larger than the vascular ducts in the vines from the other plats, but were surrounded by much thinner layers of bast tissue and showed less resistance to the edge of the microtome blade." Analyses of the vines seemed to indicate that their food constituents are only slightly influenced by the kind of fertilizer applied, while analyses of potatoes from the crops of 1909–1913, inclusive, showed considerable variation, but "not sufficient constancy in this variation to warrant any conclusions that the kind of fertilizers used has any marked effect on the chemical composition of the potato." Tests of both raw and baked potatoes for quality and texture for the entire six years showed that the plat fertilized with acid phosphate and the check plat which received no fertilizers gave potatoes of the best quality.

In regard to skin surface the fertilized plats ranked in smoothness as follows: No fertilizer, acid phosphate alone, sulphate of potash alone, complete fertilizer, nitrate of soda alone, and stable manure. In size of tubers the order from large to small was as follows: Complete fertilizer, sulphate of potash, acid phosphate, check plat, and nitrate of soda. With stable manure there were a few extraordinarily large specimens but also a high percentage of very small potatoes.

Notes on the effect of the fertilizers on the mechanical condition of the soil point to an improvement in friability except with nitrate of soda, especially accompanying the application of acid phosphate and barnyard manure. Chemical analyses of the soil of the plats are given.

It is noted that a study to correlate the bacterial nitrification, the chemical composition, and the fertilizers applied with yield of potatoes on the different plats showed little relation. "Plat 1 [barnyard manure] gave a high percentage of plant food, phosphorus, nitrogen, and potash, and a correspondingly high yield of potatoes, but the other plats seem to have no constant variation."

Several hundred measurements of the size of the starch grains showed that they vary slightly, in no constant way, the variation between counts of the same plat often being as great as those from different plats."

Analyses of sweet potato vine hay, alfalfa hay, cowpea vine hay, and timothy hay are reported. The sweet potato vine hay contained 15.5 per cent water, 1.3 nitrogen, 1.7 fat, and 20.8 crude fiber, but it was found impossible to cure and store the hay under ordinary outdoor conditions.

Tobacco seed beds, O. Olsen (*Pennsylvania Sta. Bul. 130 (1914), pp. 151–166, figs. 10*).—This bulletin gives results with steam sterilized tobacco seed beds (E. S. R., 24, p. 338; 25, p. 394), the following conclusions being drawn:

"Steam sterilization of seed beds is decidedly beneficial, as it not only effectually kills all weeds and insects when properly done, but also destroys

certain detrimental organisms in the soil. Tobacco seeds should not be sown on the beds until at least 24 hours after sterilization. Seed beds should not be too heavily fertilized, but should be well supplied with nitrogen. . . . The fertilizers should be applied before sterilizing.

"Tobacco seed should be sown without being previously forced to germinate. Seeds should not be sown too thickly, for too heavy seeding results in crowded plants with poor roots. Beds covered with muslin are cheaper and easier to water than glass-covered beds, though the latter cause faster growth. Beds should be ventilated occasionally, and kept moist but not too wet. When weather conditions permit, covers should be removed about a week before planting time, so as to allow the plants to harden."

In fertilizing, the best results were obtained by using at the rate of 20,000 lbs. barnyard manure, 1,600 lbs. cotton-seed meal, 400 lbs. acid phosphate, and 200 lbs. sulphate of potash per acre, and the bed seeded at the rate of 1 oz. per 900 sq. ft.

Wheat investigation (*Nebraska Sta. Rpt. 1913, pp. IX, X*).—This gives results which show about 4.7 bu. increase in yield by the use of selected strains of Turkey Red wheat over local seed, obtained by several farmers throughout the State in 1911–12.

The culture of winter wheat in the Eastern United States, C. E. LEIGHTY (*U. S. Dept. Agr., Farmers' Bul. 596 (1914), pp. 12, figs. 2*).—This gives cultural and harvesting notes for the production of winter wheat in the Eastern States.

The quality of clover and vetch seed found in Maryland markets in 1913, C. P. SMITH (*Maryland Sta. Bul. 179 (1914), pp. 59–88*).—This bulletin gives the results of inspection of samples of red, crimson, white, alsike, and sweet clovers, alfalfa, and hairy vetch found on the market in 1913.

Weeds, H. S. COE (*South Dakota Sta. Bul. 150 (1914), pp. 380–453, figs. 29*).—This bulletin discusses weeds in general, their manner of dissemination, and the losses they cause, and describes in detail, giving methods of eradication of each, about 50 of the more common weeds.

How to rid our farms of weeds, A. L. STONE (*Wisconsin Sta. Circ. 48 (1914), pp. 3–24, figs. 14*).—This circular describes quack grass and Canada thistle and gives means of eradication for large and small areas, besides discussing the detrimental action of weeds in general.

HORTICULTURE.

Vegetable gardening, H. P. STUCKEY (*Georgia Sta. Bul. 106 (1914), pp. 49–91, figs. 17*).—This bulletin contains practical directions for the culture of various vegetables, the subject matter being largely based on data secured from cultural experiments conducted by the station during the past five years. Some brief notes on the results of these experiments are included. The bulletin concludes with a paper on combating insect pests and fungus diseases of garden plants, prepared by B. B. Higgins and H. P. Stuckey.

In 1910 some crosses were made between the cabbage and collard in an effort to obtain new types of collards for breeding strains superior to the common collard. The collard was taken as the seed parent. Data are given on the characteristics of the first and second generation plants. Among these offspring were a number which are considered decided improvements over the ordinary collards. An effort will be made to perpetuate these types.

In a variety test of Irish potatoes it was found on the whole that the early maturing varieties gave the lightest yield. A test was made of the comparative effect on the yield of Irish potatoes from turning under a heavy summer cover

crop and from cutting the crop and raking it off. The results indicate that plowing under large quantities of green vegetable matter during the summer is not deleterious to the potato crop. The yield was slightly higher where the green crop was turned under.

A test of various early strains of tomatoes indicates that Sparks Earliana is about the best foundation stock for breeding early varieties.

Truck farming, H. Ness (*Texas Sta. Circ. 3, n. ser. (1913), pp. 5–50, pls. 3*).—This circular contains practical directions for growing the more important vegetables with special reference to conditions in Texas. Introductory considerations deal with the improvement and conservation of the soil, together with the general principles of vegetable growing.

Regional distribution of fruits and factors controlling it, J. C. Cunningham (*Proc. Soc. Hort. Sci., 10 (1913), pp. 160–165*).—The author discusses a number of natural and economic forces which have been influential in the distribution of fruits in this country. The factors considered include climate, soil, market, transportation, advertising, labor, and fungus and insect pests.

Some observations on South American fruit production, present and prospective, W. F. Wight (*Proc. Soc. Hort. Sci., 10 (1913), pp. 122–133*).—In this paper the author points out some of the more conspicuous features of the fruit industry in South America.

Orchard management (*Nebraska Sta. Rpt. 1913, pp. X, XI*).—A brief note on the relative efficiency of Bordeaux and lime-sulphur for controlling both apple scab and apple blotch.

Bordeaux was more effective as a fungicide but caused more injury to the fruit, except in the case of the first spraying, which is given before the blossoms open. It is recommended that Bordeaux be used for the first spraying and lime-sulphur for the three subsequent sprayings, except where the weather conditions become extremely dry and hot, in which case Bordeaux should be substituted for the lime-sulphur.

The penetration method of spraying, that is, the application of material in coarse drops at a very high pressure from a Bordeaux nozzle, proved more effective as a control of the codling moth than did the mist spraying in so far as the second or petal-fall spray was concerned. The best results were secured by using the penetration spray at this time and the mist spray for all later sprayings.

Composition of lime-sulphur solutions, A. C. Whittier and F. Thompson (*Proc. Soc. Hort. Sci., 10 (1913), pp. 71–76*).—Analyses of various commercially-boiled and self-boiled lime-sulphur solutions lead the authors to conclude that the only appreciable chemical difference between self-boiled and diluted commercially boiled lime-sulphur is in the amount of free calcium hydrate, the former containing an amount practically equal to that in a saturated solution of lime water, while that in the diluted commercial product is nearly negligible.

Commercially boiled lime-sulphur solution diluted with lime water to different strengths was applied to peach trees as a summer spray. None of the solutions caused injury, although one contained five times as much polysulphid as did the strongest self-boiled solution analyzed. Although no conclusive experiments have been thus far conducted, the results of the test indicate that the injury usually caused by commercial lime-sulphur solutions may be avoided providing a sufficient amount of free lime is present.

A new spray rig, J. L. Strahan (*Cornell Countryman, 11 (1914), No. 9, p. 312, figs. 3*).—The spraying machine here illustrated and described is of the two-wheeled type, the wheels consisting of sheet-metal cylinders 4½ ft. in

diameter and 18 in. high. These are hung on and connected with a 5-in. hollow, stationary iron axle. Vertical suction pipes descend from the axle in each wheel. The engine and pump are carried on a platform between the wheels and connected with the axle. Among the advantages attributed to this machine are its low center of gravity; wide tires; relative lightness as compared with machines now in use; power for agitation supplied by the horses, thereby reducing the necessary engine power; and its short construction, making it easy to turn in the orchard.

Some investigations in grafting, N. O. BOOTH (*Proc. Soc. Hort. Sci., 10 (1913), pp. 144–149*).—A discussion of the various factors which tend to restrict the art of grafting.

Characteristics of one hundred seedlings of the Northern Spy apple, W. T. MACOUN (*Proc. Soc. Hort. Sci., 10 (1913), pp. 76–83*).—Data are given showing the similarity or dissimilarity as to various characteristics between 100 Northern Spy seedlings and the Northern Spy parent. Briefly summarized, 35 per cent of the seedlings resembled the Northern Spy in general apearance, 12 per cent in form, 39 per cent in flesh, 19 per cent in color, and 35 per cent in flavor, and 28 per cent showed no marked resemblance. The Northern Spy, which is late in coming into bearing, has given this characteristic to most of the seedlings.

The author concludes that the Northern Spy is one of the best parents to use in crossbreeding, since it has impressed its good characteristics on a large proportion of its progeny, although a self-sterile or partly self-sterile variety.

The effect of pollen of Wagener and McIntosh on the size of and number of seeds in Wealthy apples, J. W. CROW (*Proc. Soc. Hort. Sci., 10 (1913), pp. 153–155*).—The author used pollen of the Wagener and of the McIntosh apples in fertilizing flowers of the Wealthy apple.

The data secured indicate that McIntosh pollen is more effective in producing a set of fruit on Wealthy than is the Wagener pollen. The resulting fruit is likewise more abundant in proportion to the number of blossoms pollenized, and the average size of the fruits is larger. On the other hand, the average number of good seeds per fruit was greater for the Wagener pollen in spite of the fact that the average number of seeds which had undergone at least partial development was approximately the same in both cases. It appears that the McIntosh pollen may have some effect on fruit setting and the size of fruit entirely separate and distinct from its effect in bringing about actual fertilization.

Some peculiarities of native Georgia apples, T. H. MCHATTON (*Proc. Soc. Hort. Sci., 10 (1913), pp. 67–70*).—The author here calls attention to a peculiar type of basin, calyx, and calyx tube observed in a large number of varieties of apples grown in the mountains of northern Georgia. The calyx tube is found to be very broad and deep and somewhat between urn and cone shaped. The lobes appear to have fallen away, leaving a very broad and open space at the bottom of the basin. The apples also have a marked oblate shape.

Factors which determine color and size of peaches, M. A. BLAKE (*Proc. Soc. Hort. Sci., 10 (1913), pp. 83–88*).—A general discussion relative to the various factors influencing color and size of peaches.

Effect of pollination on the fruit of Diospyros kaki, H. H. HUME (*Proc. Soc. Hort. Sci., 10 (1913), pp. 88–93*).—The author's observations relative to the fruiting habits of the Japanese persimmon lead him to conclude that the fruits of *D. kaki* of the same variety and on the same tree often vary greatly in size, shape, color of flesh, quality, taste, and time of ripening. The underlying cause of these variations is attributed largely to the pollination factor. All varieties of Japanese persimmons thus far studied are light-fleshed when

seedless but certain varieties show a dark area in the flesh when seeds are present. Other varieties are always light-fleshed even when seeds are present. Both dark and light fleshed varieties may occur on the same tree.

No conclusions have been reached relative to the physiological causes which underlie the changes in color of the flesh.

Prune growing in southwestern Washington, O. M. MORRIS (*Washington Sta. Popular Bul. 57*[a] *(1914), pp. 13, figs. 4*).—This is a preliminary report on a survey of the soil and orchard conditions in southwestern Washington in conjunction with a study of the weather records. It discusses the cause of the frequent failure of the prune crop in certain localities and suggests certain changes in orchard management for the improvement of these conditions.

Summing up the observations thus far made it appears that unfavorable weather at a critical time during the blossoming or immediately after, together with a weak condition of the trees, has been the greatest cause of crop failure.

Orchard notes, J. B. THOMPSON (*Guam Sta. Rpt. 1913, pp. 17–19, pl. 1*).—This comprises brief notes on the behavior of a number of fruits and miscellaneous plants being tested at the station grounds.

The propagation of the "Saipan" mango (*Mangifera odorata*) on seedling stocks of the ordinary Guam mango (*M. indica*) has been readily accomplished by Oliver's system of inarching seedling stocks (E. S. R., 24, p. 736). In the work at the station inarched plants have flowered within four months from the time of inarching. The results indicate a tendency of this variety to early bearing when inarched.

The jelly plant *Abcra gardnerii*, introduced from Florida in 1911, has been successfully fruited and seedlings are being grown for distribution. Thus far the results with citrus trees have been unsatisfactory, due, it is believed, to unfavorable soil conditions. The trees have been lost largely from a disease, probably "gum disease," which is prevalent among citrus trees throughout the island. A further introduction of several varieties was made during the year. Seedlings of the cherimoya (*Annona cherimola*) were found to inarch readily with those of both the bullock's heart (*A. reticulata*) and the sour-sop (*A. muricata*). A list is given of a number of new fruit and other economic plants that were introduced successfully during the year.

Small fruits for Colorado, E. P. SANDSTEN (*Colorado Sta Bul. 195 (1914), pp. 3–19, figs. 2*).—This bulletin contains cultural directions for growing red, purple-cane, and black raspberries, blackberries, dewberries, loganberries, strawberries, currants, and gooseberries, including information relative to varieties adapted to Colorado and insects and plant diseases.

State bog report, H. J. FRANKLIN (*Ann. Rpt. Cape Cod Cranberry Growers' Assoc., 26 (1913), pp. 17–32, 43–47*).—A report on cranberry investigations presented to the Cape Cod Cranberry Growers' Association, August, 1913. The substance of this report is essentially the same as that noted (E. S. R., 30, p. 142) with the addition of some preliminary observations for the season of 1913.

The "little bogs" at Amherst, T. W. MORSE (*Ann. Rpt. Cape Cod Cranberry Growers' Assoc., 26 (1913), pp. 6–9*).—The first season's results from fertilizer tests on experimental cranberry plats located at Amherst, Mass., are here reported.

Although no conclusions are thus far drawn relative to a fertilizer for cranberries, the heaviest yields of fruit were secured where potash predominated. Nitrate and acid phosphate fertilizers had a similar effect upon the yield. Potash gave the least vine growth and nitrate the most. The results as a

[a] The popular bulletin entitled Sheep for Washington Farms, issued September 13, 1913, and abstracted (E. S. R., 29, p. 870) as Popular Bulletin 57, is evidently now regarded as Popular Bulletin 58.

whole show that of 20 plats receiving fertilizers only 3 bore smaller crops than the average of the 7 unfertilized plats and only one of the unfertilized plats had more berries than the average yield of the fertilized plats.

Some limited experiments dealing with the use of lime for cranberry bogs failed to show either an advantageous or a detrimental effect from lime.

Raspberry breeding, R. WELLINGTON (*Proc. Soc. Hort. Sci., 10 (1913), pp. 155–159*).—A brief study of the first generation characteristics of a number of raspberry crosses which were made at the New York Geneva Station.

Strawberries under irrigation in south Texas, E. E. BINFORD (*Texas Sta. Circ. 1, n. ser. (1913), pp. 3–13, figs. 2*).—A practical treatise on the culture of strawberries under irrigation, based on data secured by experiments at the Beeville Substation and also on observations of commercial practices in south Texas and on the literature of the subject. The phases discussed include soils and their preparation, transplanting, varieties, sex of plants, spraying, rules for picking and packing, irrigation, picking season, summer treatment, and cost of production.

The varieties that have proved most successful in the extreme south are Saint Louis, Klondike, Lady Thompson, and Buster. Other varieties that have tested well at the Beeville Substation are Brandywine, Marshall, Ben Davis, and Michael Early. The cost of production for the first year, based on data secured from a number of growers by the Office of Farm Management of the U. S. Department of Agriculture, approximates $200 per acre.

Sterility in the grape, M. J. DORSEY (*Proc. Soc. Hort. Sci., 10 (1913), pp. 149–153*).—A brief summary of an investigation to be reported on in full at a later date.

Attention is called to the necessity of distinguishing between sterility resulting from differences in essential organs and that due to unfavorable weather conditions occurring at flowering time during many seasons. Sterility is associated with both hybridity and diœciousness. The native species of our grapes are, generally speaking, diœcious, and fertile pollen borne by the pistillate flower with reflexed stamen is rare. This condition suggests a deep-seated relation between sterility and functional decline. Taking into consideration the fact that there are both fertile and sterile hybrids, the author concludes that the contributory causes of sterility are deep-seated influences operating to produce declinism or diœciousness. The deep-seated nature of sterility and its relation with diœciousness indicate that it can not be overcome by cultural conditions.

A bibliography of consulted literature is given.

The fertilizing action of sulphur on the vine, J. CHAUZIT (*Rev. Vit., 41 (1914), No. 1052, pp. 175–179, figs. 2*).—The author conducted two distinct series of experiments on ½-acre plats of grapevines. In the first series it was sought to determine what effect sulphur produced on soils which had not received farmyard manure since 2, 3, 4, and 5 years. The second series of experiments dealt with the action of sulphur mixed with manure or sown broadcast and applied in various quantities.

From the work as a whole it is concluded that sulphur acts favorably, both on the growth and yield of the vine. The greater the quantity of organic matter in the soil and the more recently it has been applied the more pronounced is the action of sulphur. To secure the best results the sulphur should be thoroughly mixed with the organic matter on which it is to act. As far as the quantities applied in this test are concerned the yield increased with an increase in the amount of sulphur. The largest amount applied was 360 lbs. per acre mixed with manure. The manure used with or without sulphur was

supplemented by a dressing at the rate of 180 lbs. of muriate of potash and 360 lbs. of superphosphate per acre.

Brief reference is also made to other investigations with sulphur.

How sulphur stimulates plant growth, F. DE CASTELLA (*Jour. Dept. Agr. Victoria, 12 (1914), No. 5, pp. 289–291*).—A review of the above investigation.

Unusual methods of propagating nut trees, R. T. MORRIS (*North. Nut Growers Assoc. Proc., 4 (1913), pp. 43–48, fig. 1*).—The author discusses a number of unusual methods of propagating nut trees.

When grafting the shagbark hickory with scion wood more than one year old, the author found that if a small side branch from old wood carries a large terminal bud this bud will start promptly, providing care is taken to remove vigorous stock sprouts. Scions 4, 5, and even 6 years of age have been used with success.

An inarch method was recently experimentally employed with success in grafting hickories. In this method the scion is cut free from the parent plant and the part below the inarch is inserted in a test tube or a small bottle containing water. Whereas the use of chemicals in the water prevented the development of unfavorable micro-organisms, they likewise interfered with the union of stock and scion. It was found that the water can be kept in good condition by inserting specimens of bladderwort (Utricularia). Two specimens thus grafted in the summer were found to have made a good union in the fall. The successful development of this method will be of special value in extending the grafting season.

The author has also met with success in developing plants of the shagbark hickory, beech, and hazel from adventitious root buds started in sand. With the beech and hazel the buds started from various sized root segments, but with the hickory the buds started best upon root segments more than 6 in. in length and more than ½ in. in diameter. Hazels may be propagated from cuttings similar to rose cuttings, but not so readily as with roses.

Attention is also called to the development of seedlings grown from seed secured from pistillate chinaquapin flowers, which were bagged to prevent pollination. Subsequent check experiments indicate that the chinquapin will develop nuts freely without pollen and that the bitternut hickory, shagbark hickory, and pignut will develop nuts sparingly without pollen. In advance of microscopic examination of the ovules, this phenomenon is attributed to parthenogenesis.

Multiplication of floral parts in the carnation, C. H. CONNORS (*Proc. Soc. Hort. Sci., 10 (1913), pp. 93–99*).—The substance of this paper has been abstracted from another source (E. S. R., 30, p. 644).

Individuality in rose plants, M. A. BLAKE (*Proc. Soc. Hort. Sci., 10 (1913), pp. 133–144*).—This comprises a study on the individuality of rose plants based on data secured in a soil experiment with My Maryland roses, conducted for a number of years at the New Jersey Stations (E. S. R., 30, p. 344).

Sweet pea studies.—IV, Classification of garden varieties of the sweet pea, A. C. BEAL (*New York Cornell Sta. Bul. 342 (1914), pp. 217–360, pls. 23, fig. 1*).—In continuation of previous reports (E. S. R., 28, p. 641) descriptions are given of a large number of varieties of sweet peas being tested at the station in cooperation with the American Sweet Pea Society. The author briefly reviews the methods which have been previously employed in the classification and description of varieties, and outlines the method of classification employed in the present descriptions.

The results previously noted relative to autumn and spring planting tests (E. S. R., 25, p. 645) are briefly summarized here. A germination test of old seed of a great many varieties conducted in 1910 indicated that white-seeded

varieties lose their vitality in a greater degree than do the black-seeded varieties of the same year's crop. Nearly all varieties from the 1904 crop gave as good results as were obtained in general from the 1909 crop.

FORESTRY.

Tree guide, JULIA E. ROGERS (*Garden City, N. Y., 1914, pp. VIII+265, figs. 244*).—A popular guide to the trees common to the eastern half of Canada and the United States. In addition to the native species the most important cultivated species brought from other countries are also described.

Yellow pine, A. T. NORTH (*St. Louis, Mo., 1913, 4. ed., pp. 130, figs. 22; rev. in Engin. News, 71 (1914), No. 12, p. 649, 650*).—This handbook contains tables of the strength of beams, grouping the timbers in terms of their depth; factors for converting safe loads to other fiber stresses than that on which the tables are based; deflection; properties of actual size instead of nominal size timbers; maximum bending moment; strength of wooden columns; trussed beams; joists, trusses, and nailed and spiked joints; and tests of timbers.

On the conditions for the natural occurrence of spruce, P. E. MÜLLER (*Centbl. Gesam. Forstw., 40 (1914), No. 1-2, pp. 11-27*).—A review of European literature dealing with the factors influencing the natural distribution of spruce trees.

Influence of precocity of thinning on the yield of regular stands of spruce, E. MER (*Rev. Eaux et Forêts, 53 (1914), Nos. 11, pp. 345-349; 12, pp. 377-386*).—As a result of observations conducted over a period of 30 years and here reported, the author concludes that early thinning undertaken with a view of favoring the development of future trees have accelerated the diameter and volume growth of the trees, and have likewise increased the financial returns.

Can the yield of rubber from Hevea trees be increased by commercial fertilizers? A. W. K. DE JONG (*Teysmannia, 25 (1914), No. 3, pp. 139-144, pl. 1*).—In the experiments here reported potassium, phosphoric acid, and sulphate of ammonia were tried, both alone and in combination, as fertilizers for the Hevea rubber tree. The increased yield of rubber secured by the use of commercial fertilizers, particularly a complete fertilizer, appears to warrant a further thorough investigation of the subject.

[The rubber industry in Brazil] (*Min. Agr. Indus. e Com. [Rio de Janiero] Monograph, 1913, Nos. 9, pp. 47+32, pls. 19; 10, pp. 26, pls. 10; 11, pp. 78, pls. 5; 12, pp. 51; 13, pp. 32, figs. 9; 14, pp. III+118+55, pls. 50, figs. 14; 15, pp. 49, pls. 16; 18, pp. 30, pls. 22; 19, pp. 31+22, pls. 20; 20, pp. 22+12, pls. 4*).—This comprises a series of monographs containing descriptive and statistical accounts of the rubber industry in various regions of Brazil. The monographs given in order corresponding to the numbers above listed are as follows: The Rubber Industry in Pernambuco, by N. C. Pereira de Andrade; in Alagoas, by L. de Moraes; in Sergipe, by A. M. Rabello; in Bahia, by A. Hermenegildo da Silva; in Espirito Santo, by A. A. Campos da Cunha; in Rio de Janeiro, by A. Pereira da Silva; in Sao Paulo, by G. Catramby; in Januaria, State of Minas Geraes, by C. Guimarães junior; in Goyaz, by J. Guedes de Amorim; and balata rubber, by G. Barroso.

Note on a latex hydrometer, B. J. EATON (*Agr. Bul. Fed. Malay States, 2 (1914), No. 9, pp. 224-226*).—The author briefly describes a hydrometer which has proved satisfactory for tropical use in determining the rubber content of latex.

[The lumber industry in Wisconsin], MARY DOPP (*Bul. Amer. Geogr. Soc., 45 (1913), No. 10, pp. 736-749, figs. 4*).—A brief historical and statistical review of lumbering and forestry in Wisconsin.

Manitoba, a forest Province, R. H. CAMPBELL (*Dept. Int. Canada, Forestry Branch Circ. 7 (1914), pp. 16, figs. 9*).—An address on the extent, condition, and management of the forest resources of Manitoba, delivered before the Canadian Forestry Association, at Winnipeg, July, 1913.

Trent watershed survey, B. E. FERNOW, C. D. HOWE, and J. H. WHITE (*Toronto: Com. Conserv. Canada, 1913, pp. VIII+156, pls 19*).—This embraces the results of a reconnaissance of the Trent watershed in Ontario. The subject matter is discussed under the following general headings: Conditions in the Trent watershed and recommendations for their improvement, physiographic and forest conditions, and economic and industrial conditions. Information relative to the lumbering industry in the Trent watershed, physical features and geology of the area, mineral occurrences, and other miscellaneous data are appended.

Forest protection in Canada, 1912, C. LEAVITT (*Toronto: Com. Conserv. Canada, 1913, pp. 174, pls. 23*).—This comprises a progress report for the year 1912 relative to methods of forest protection and results secured, together with considerable information on the subject of forest protection based upon observations and methods employed in different sections of the United States.

The subject matter is discussed under the following general headings: Protection from railway fires, forest fires, and the brush disposal problem, the top-lopping law in the Adirondacks, the use of oil as a locomotive fuel from a fire-protective point of view, and forest planting in Canada. The report of the committee on forests, Commission of Conservation, 1912, presented at the annual meeting at Ottawa, is also included. Statistical information dealing with the Dominion forest reserves area extensions, a memorandum regarding the country between Sudbury and Port Arthur, by J. H. White, and various opinions on oil fuel are appended.

Cooperative forest fire protection, G. E. BOTHWELL (*Dept. Int. Canada, Forestry Branch Bul. 42 (1914), pp. 28, pl. 1, figs. 10*).—In this bulletin the author describes the development of cooperative forest-fire protective associations in America, particular attention being given to the development and work of the St. Maurice Fire Protective Association in the Province of Quebec.

The care of the woodlot, B. R. MORTON (*Dept. Int. Canada, Forestry Branch Circ. 10 (1914), pp. 16, figs. 11*).—A popular treatise on woodlot management in eastern Canada.

DISEASES OF PLANTS.

The nonvalidity of the genus Lasiodiplodia, J. J. TAUBENHAUS (*Abs. in Phytopathology, 4 (1914), No. 1, p. 47*).—The author states that during the past two years his work with *L. tubericola* and *L. nigra* and upon *Diplodia gossypii* and *D. natalensis* shows that the presence of paraphyses is not of constant occurrence. Under certain conditions it was found that either fungus may dispense with paraphyses or produce the same, and in view of these facts it is believed that the genus Lasiodiplodia should be abolished.

Identity of Peridermium fusiforme with P. cerebrum, G. G. HEDGCOCK and W. H. LONG (*U. S. Dept. Agr., Jour. Agr. Research, 2 (1914), No. 3, pp. 247–250, pl. 1*).—As the result of field and cultural studies the authors claim that *P. fusiforme* and *P. cerebrum* are both æcial stages of the same fungus, *Cronartium cerebrum* n. comb., and that they are not sufficiently differentiated to constitute separate races. In this connection it is further stated that *C. quercus* of Europe is not identical with *C. cerebrum* of the United States.

Biological strains of Sphæropsis malorum, L. R. HESLER (*Abs. in Phytopathology, 4 (1914), No. 1, p. 45*).—Studies are reported of Sphæropsis taken from 15 different host plants, cross inoculations being made on a large number

of hosts. Pedigreed cultures of a given strain were found to show as wide morphological variation as several strains from different hosts. The results are held to indicate that on several hosts under consideration there is one large species showing many biological races.

Life history of Sphæropsis malorum, C. L. SHEAR (*Abs. in Phytopathology, 4 (1914), No. 1, pp. 48, 49*).—In a previous publication (E. S. R., 23, p. 454) the author presented evidence from which it was concluded that the perithecial stage of the apple Sphæropsis is a form of Melanops, which was found on dead apple branches. Subsequent investigations have confirmed the previous conclusion, and by means of cultures from single ascospores of *M. quercuum* obtained from an old apple tree, *S. malorum* has been obtained.

Grain smuts: Their causes and treatments, M. T. COOK (*New Jersey Stas. Circ. 36, pp. 4*).—Brief descriptions are given of the loose smut of oats, loose smut of wheat, stinking smut or bunt of wheat, and smut of corn, with directions for their control so far as means are known.

Experiments on the control of certain barley diseases, A. G. JOHNSON (*Abs. in Phythopathology, 4 (1914), No. 1, p. 46*).—In connection with investigations on the Helminthosporium disease of barley, seed was infested with the covered and loose smuts, as well as by the stripe disease (*H. gramineum*). Seed was treated by the hot water method and also by variations of the formaldehyde treatment.

The control plats averaged from 8 to 10 per cent of covered and loose smut and 20 per cent stripe disease. Where the seed had received the modified hot water treatment, that is soaked for five hours in cold water and 15 minutes at 52° C., the two smuts were perfectly controlled and the stripe disease reduced to less than 1 per cent. Where seed was soaked for two hours in 1 lb. formalin to 40 gal. water, the covered smut was perfectly controlled and loose smut reduced to a bare trace. This treatment was also highly efficient against the stripe disease. The formaldehyde gas treatment proved less efficient than the water solution, and inhibited germination considerably.

Similar tests were conducted with two lots of seed infested respectively with *H. teres* and *H. satirum*, and in both cases the primary infections were reduced but not entirely eliminated.

Some observations and experiments on the blackleg disease of cabbage, M. P. HENDERSON (*Abs. in Phytopathology, 4 (1914), No. 1, pp. 46, 47*).—A report is given of studies to determine the host range of the fungus on the Cruciferæ and whether it may not be disseminated with the seed of cabbage. Inoculations were made on 7 genera, including 15 species and 4 varieties of Cruciferæ, and infections occurred in all but 2 species, *Lepidium virginicum* and *Capsella bursa-pastoris*. In other series of experiments mother seed plants were inoculated by spraying the plants with a spore suspension, after which they were covered with a bell-jar. Infections occurred on leaves, flower stalks, and seed pods. Seeds removed and plated gave pure cultures of the fungus.

The observations and experiments outlined indicate a wide host range for the blackleg organism, thus insuring easy and rapid distribution in the field, and that infected seed may also serve as a means of dissemination.

Progress in developing disease-resistant cabbage, L. R. JONES (*Abs. in Phytopathology, 4 (1914), No. 1, pp. 47, 48*).—In continuation of a report previously given (E. S. R., 29, p. 646), the author gives an account of experiments in developing cabbage resistant to Fusarium.

Many of the selected strains of seed tested in 1912 proved equally resistant in 1913, although the weather conditions were considered somewhat more favorable for the fungus in the latter year. The resistant varieties secured in 1912 were all of the Danish ball head or winter types. In 1913 one of the kraut

types, Volga, proved more highly resistant than the best secured in 1912. From the second generation of selected heads sufficient seed was obtained in 1913 for a wider qualitative test of resistance on the part of these varieties.

Decay of celery in storage. D. REDDICK (*Abs. in Phytopathology, 4 (1914), No. 1, p. 45*).—Some experiments are reported upon to determine the keeping quality of celery affected by the late blight disease (*Septoria petroselina*) when placed under modern storage conditions. When stored at a temperature of 31° F. from October 15 to December 23, 1912, there was no appreciable spread of the disease.

The author also reports the deterioration of a carload of celery which was stored in November at a temperature of 31 to 32°. A study showed that this lot was infected with *Sclerotinia libertiana*, and cultures of the fungus were obtained which were used for inoculations with positive results.

Some points in the life history of Phytophthora on ginseng. J. ROSENBAUM (*Abs. in Phytopathology, 4 (1914), No. 1, p. 44*).—A disease of ginseng tops due to Phytophthora has been previously noted by Hori (E. S. R., 19, p. 752). Some additional observations are reported and it is said that the disease on the leaves and stems, as well as a very serious root disease, is caused by the same organism. The Phytophthora organism may first appear on the tops, work its way down by way of the stems, and eventually rot the root. Or it may first appear on the root, and after rotting this, may travel upward into the stem and appear in the tops. The conidia of the fungus may be washed down into the soil and infect the root, provided the latter is not too deep below the surface.

Fusaria of potatoes. C. D. SHERBAKOFF (*Abs. in Phytopathology, 4 (1914), No. 1, pp. 43, 44*).—This is the result of a taxonomic study of the species of fungi of the genus Fusarium as they occur in *Solanum tuberosum*.

The author isolated 120 strains which seemed morphologically different, but when grown on artificial and natural media about 70 of them were found to be simply morphological variations. Of the remaining 50, many were identified with the species described by Wollenweber (E. S. R., 29, p. 444).

A study of the annual recurrence of Phytophthora infestans. I. E. MELHUS (*Abs. in Phytopathology, 4 (1914), No. 1, p. 54*).—A large number of potato tubers infected with *P. infestans* were planted in northern Maine under field conditions to determine the possibility of infection through the tuber. This locality is said to be favorable for the annual recurrence of the blight, but the land used in this experiment had not grown a crop of potatoes for at least five years.

Some of the diseased tubers produced plants which became infected by the mycelium in the parent tuber. Above the surface of the soil the fungus produced spores and infected the foliage and neighboring shoots in the same and adjoining hills. It is considered that this experiment demonstrated that seed potatoes affected with *P. infestans* may function in starting an epidemic of late blight.

Some recent studies on new or little-known diseases of the sweet potato. J. J. TAUBENHAUS (*Abs. in Phytopathology, 4 (1914), No. 1, pp. 50, 51*).—In addition to the black rots previously described (E. S. R., 30, p. 150), accounts are given of stem rot due to *Fusarium batatis*, ring rot, which recent studies have shown is a form of soft rot (*Rhizopus nigricans*), a white rust caused by *Cystopus ipomœæ panduranæ*, which is said to be of considerable importance, and a new leaf spot, which is attributed to a species of Septoria as yet undescribed.

Blossom-end rot of tomato. C. BROOKS (*Abs. in Phytopathology, 4 (1914), No. 1, p. 49*).—The author states that this disease is usually not accompanied by any organism, although bacteria and fungi are present in late stages of the

rot. These organisms, when inoculated into healthy green tomatoes, have failed to produce the disease. The development of the disease is said to be favored by heavy applications of commercial fertilizers and greatly increased by the addition of stable manure. It is decreased by the application of sodium nitrate, and is worse on heavy than on light soil. Its development may be favored by a lack of water and also by excessive watering, depending upon the condition of the plants at the time of the change. Lime has been found to be a partial preventive and it also serves as a remedial agent on plants already predisposed to the disease.

Diseases of tobacco, J. JOHNSON (*Wisconsin Sta. Bul. 237 (1914), pp. 1–27, figs. 7*).—The author gives descriptions of the more common and injurious diseases affecting tobacco in the seed bed, field, and curing house, and suggests methods for their control.

The most serious troubles of the seed bed are said to be the bed rot or damping off and the root rot or black root. The first-named disease is due to *Pythium debaryanum* and Rhizoctonia, while the second is caused by the fungus *Thielavia basicola*. For the control of the diseases of the seed bed sterilization of the soil is recommended, and the steam sterilization by the inverted-pan method is said to be the most efficient and economical of any method tested.

The root rot may also attack tobacco in the field, causing large losses. The author believes that this disease is, in some cases at least, responsible for the so-called running out of tobacco soils rather than a depletion of fertility.

Descriptions are given of rusts of the leaves, which are due to a number of causes, the mosaic disease or calico, shed burn or pole rot, stem rot, wet butts or fat stem, white vein diseases, black rot occurring in sweating tobacco, etc.

For most of the troubles of the curing house, proper attention to ventilation and temperature, it is said, will reduce the loss.

Two new diseases occurring in the field have been observed and studied in a preliminary way. These have been called black leg or canker and hollow stalk. The first is characterized by the decay of the stalks at or above the surface of the ground and seems to be due to the same organisms which cause the damping off of seedlings in the plant beds. The hollow stalk is said to be a decay of the pith of the stalk, which sometimes extends out into the midrib and veins of the leaves, causing them to droop. A bacillus of the soft rot type has been isolated and the disease produced by inoculating healthy plants, which seems to indicate that it is of a bacterial nature.

Disease resistance in tobacco to root rot, J. JOHNSON (*Abs. in Phytopathology, 4 (1914), No. 1, p. 48*).—The root rot of tobacco, due to *Thielavia basicola*, is said to be becoming of economic importance to tobacco growers. In 1913 the author studied the "Burley sick soils" of Ontario and the "deteriorated tobacco soils" of Wisconsin, upon which root rot was found very prevalent. Marked differences in resistance were observed for different varieties, White Burley being very susceptible to root rot, while the variety Little Dutch was found to be very resistant. The Connecticut Havana is approximately intermediate between the other two varieties in resistance to disease. A large acreage was examined for resistant plants and a number were found sufficiently resistant to warrant bagging and preserving for seed. These are to be tested for further selection and breeding in 1914.

Some diseases of nursery stock, M. T. COOK (*New Jersey Stas. Circ. 35, pp. 24, figs. 15*).—A description is given of some of the more serious diseases which are likely to be carried by nursery stock, attention being drawn to them in order that growers and nurserymen may be on their guard concerning their introduction and dissemination.

Among the diseases described are the crown gall, fire blight, apple scab, black rot, peach yellows, little peach, peach leaf curl, black knot, chestnut blight, and anthracnose of berries.

Attention is called to the fact that growers frequently heel in stock that is left over, and this becomes a source of many serious infections. The author recommends that such stock should be either properly reset or destroyed.

Crown gall and hairy root, M. T. COOK (*New Jersey Stas. Circ. 34, pp. 14, figs. 8*).—A description is given of crown gall and hairy root, most of the information being drawn from other investigators, but the author adds a number of his own recent observations concerning these diseases.

The circular concludes with a number of suggestions, the observation of which would tend to reduce the occurrence of the disease to a minimum.

Perithecia in cultures of Venturia inequalis, F. R. JONES (*Abs. in Phytopathology, 4 (1914), No. 1, pp. 52, 53*).—The author reports observing perithecia of the apple scab fungus in cultures taken from ascospores in May, 1913, the perithecia appearing in the latter part of November.

Comparative dusting and spraying experiments, F. M. BLODGETT (*Abs. in Phytopathology, 4 (1914), No. 1, p. 44*).—Experiments are reported in which a mixture of sulphur and arsenate of lead applied as a powder and also in suspension in water as a liquid spray were compared with the regular lime-sulphur solution for the control of apple scab.

The dustings with sulphur and sulphur in suspension in water were found to control scab to a large extent, closely approximating that of lime-sulphur solution. The control of insects was best effected by the use of the dust sprays, and the apples from this block were considered commercially the best.

A preliminary report on fruit infection of the peach by means of inoculations with Cladosporium carpophilum from peach twigs, G. W. KEITT (*Abs. in Phytopathology, 4 (1914), No. 1, pp. 49, 50*).—The author describes the successful infection of peaches with spores from peach twigs, claiming that the artificial production of peach scab in this manner has not hitherto been recorded.

Gum formation in citrus as induced by chemicals, B. F. FLOYD (*Abs. in Phytopathology, 4 (1914), No. 1, p. 53*).—The author tested 28 different organic and inorganic chemicals to determine their affect on gum formation in citrus trees, the chemicals being inserted into the trunk of young budded trees. Thirteen of the number, including acids, alkalis, and salts of the heavy metals, induced the formation of gum in the living tissue bordering that killed by the chemical. The most copious production of gum was induced by copper sulphate and other salts of heavy metals. A microscopic examination showed that the gum originated in the live unlignified xylem tissue, usually in that adjacent to the dead tissue. In the case of gum production by the salts of the heavy metals, gum formation was induced in succulent terminal branches which showed no tissue killed by the chemicals.

Fungus gummosis of citrus in California, H. S. FAWCETT (*Abs. in Phytopathology, 4 (1914), No. 1, p. 54*).—The author states that at least four different and distinct gum diseases of citrus trees occur in California—psorosis, mal di gomma, and two forms of lemon gummosis. The latter two have been described (E. S. R., 30, p. 51). A number of other fungi, such as *Alternaria citri*, *Penicillium roseum*, *Coryneum beycrinckii*, and *Fusarium* sp., are capable of inducing gum formation when inserted into cuts. The disease, it is said, may be controlled by avoiding the conditions favorable for infection, by making all new plantings with trees budded high on sour stocks, and by trimming out and painting the trunks with concentrated Bordeaux mixture.

Citrus root nematode, N. A. COBB (*U. S. Dept. Agr., Jour. Agr. Research, 2 (1914), No. 3, pp. 217–230, figs. 13*).—An account is given of a study of the

life history of the citrus root parasite *Tylenchulus semipenetrans*, previously described (E. S. R., 30, p. 648.)

This nematode was first noted in California (E. S. R., 28, p. 850). The author, from material received from many of the citrus-producing countries, has found that this organism is widely spread and that it seems to be confined to plants belonging to the citrus family. It is believed that *T. semipenetrans* is an injurious parasite that kills the feeding roots of citrus trees, the extent of the damage varying in different regions and under different conditions. In the progress of the life history studies it was discovered that hot water was fatal to the nematode and that citrus roots would survive temperatures required to kill it. This fact, it is thought, would indicate that a hot water treatment may prove more or less efficient in controlling the spread of the pest.

The poor nitrifying power of soils a possible cause of die-back (exanthema) in lemons, C. B. LIPMAN (*Science, n. ser., 39 (1914), No. 1011, pp. 728–730*).—A preliminary account is given of observations and experiments made on several citrus soils, in which were trees affected with die-back.

The author is led to believe from his investigations that a poor nitrifying power on the part of the soil, with the ammonifying power remaining normal, may be the cause of the peculiar manifestations which are characteristic of the disease. Samples of these soils were examined, and in every case found to have a very slight nitrifying power or none at all. When dried blood or sulphate of ammonia was added to them there was only a slight increase or none of nitrates, while the ammonification proceeded very rapidly. The author believes, and his hypothesis is confirmed by results given by Florida investigators (E. S. R., 23, p. 447) relative to the increased amount of die-back where organic manures were used in citrus groves, that not only die-back is to be accounted for in this way, but that the equally destructive and much more widely spread disease, mottled leaf, is capable of being explained in a similar manner.

Pellicularia koleroga on coffee in Porto Rico, G. L. FAWCETT (*U. S. Dept. Agr., Jour. Agr. Research, 2 (1914), No. 3, pp. 231–233, figs. 3*).—As the result of a study of the leaf blight of coffee in Porto Rico, the author has concluded that it is due to the fungus *P. koleroga*, originally described from India, but which, it has been claimed by mycologists, does not occur in Porto Rico. In connection with this investigation a study was made of a disease known as candelillo in Venezuela. This disease has been formerly identified as being caused by *P. koleroga*, but the author believes it is not due to that fungus.

A destructive nematode introduced into the United States, L. P. BYARS (*Abs. in Phytopathology, 4 (1914), No. 1, pp. 45, 46*).—The author reports observing in hyacinths, in the bulb garden of the U. S. Department of Agriculture at Bellingham, Wash., the nematode *Tylenchus dipsaci*. This nematode not only attacks the bulbs but also the aerial portion of its host, abandoning the leaves toward the end of the season and returning to the bulb. The infection is said to be readily carried by the bulbs, and on account of the destructive nature of the parasite it is considered important to eradicate any bulbs that may be found infected and to make rigid inspection of all imported hyacinth bulbs.

Sphæropsis canker of Quercus prinus, W. H. RANKIN (*Abs. in Phytopathology, 4 (1914), No. 1, pp. 44, 45*).—This disease of chestnut oaks is said to have been very prevalent at Yonkers, N. Y., in July, 1912. The foliage was destroyed, and on the older limbs numerous cankers were found. Isolations were made of the above fungus, and inoculations produced cankers in 47 days. The organism agrees morphologically with the description of *S. malorum*, and

it is believed that this disease is the same as that described by Miss Ingram (E. S. R., 27, p. 654).

A little-known disease of chestnut and oak trees, F. D. HEALD (*Abs. in Phytopathology, 4 (1914), No. 1, p. 49*).—The author describes a disease of chestnut and oak trees due to *Strumella coryneoidea*.

Two forms of the disease are recognized, first, the canker type, in which the progress of the fungus is slow, with a pronounced callus formation at the advancing edge of the lesion; and second, the diffuse type, in which the fungus spreads more rapidly, killing the tissues so quickly that callus formation is impossible. Between these two forms there are said to be intermediate types. The trouble has been observed in widely separated localities in Pennsylvania and it is believed to be of general distribution in forests of the State.

The relation of temperature to the expulsion of ascospores of Endothia parasitica, R. C. WALTON (*Abs. in Phytopathology, 4 (1914), No. 1, p. 52*).—Field and laboratory tests are reported upon to determine the effect of temperature on the expulsion of ascospores of the chestnut blight fungus.

From November 26, 1912, to March 20, 1913, with maximum temperatures of from 35 to 60° F. there was no expulsion of ascospores. In the laboratory, when tested at temperatures from 36 to 100°, there was no expulsion of spores at the lowest temperature, but at higher temperatures there was a gradual increase in the amount until the optimum was reached, beyond which expulsion gradually lessened.

Wind dissemination of ascospores of the chestnut blight fungus, F. D. HEALD, M. W. GARDNER, and R. A. STUDHALTER (*Abs. in Phytopathology, 4 (1914), No. 1, p. 51*).—In a previous account (E. S. R., 29, p. 753) the results of ascospore dissemination under artificial conditions were described. In the present paper experiments under natural conditions are reported upon which indicate that viable spores were caught in agar plates 365 ft. to the leeward of infected trees. Prolonged exposures were made of sterile water in dishes located 380 ft. from the nearest chestnut tree, and when plated out colonies of the fungus developed in abundance.

Insects as carriers of the chestnut blight fungus, R. A. STUDHALTER (*Abs. in Phytopathology, 4 (1914), No. 1, p. 52*).—An investigation was made of 75 insects as possible carriers of spores of *Endothia parasitica*. Eight specimens of *Leptostylus maculata* gave positive results, indicating that this beetle is an important agent in the dissemination of spores of the blight fungus.

Control of the Ribes generation of the white pine blister rust, C. VON TUBEUF (*Naturw. Ztschr. Forst u. Landw., 12 (1914), No. 3, pp. 137–139*).—Discussing a previous contribution by himself (E. S. R., 31, p. 50), also one by Ewert (E. S. R., 31, p. 346), the author states that tender shoots of young pines are infected by sporidia from *Cronartium ribicolum* originating on Ribes, and that infection from pine to pine does not occur.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

The common mole.—Runway studies; hours of activity, T. H. SCHEFFER (*Trans. Kans. Acad. Sci., 26 (1912), pp. 160–163, fig. 1*).—This is supplementary to the observations previously noted (E. S. R., 23, p. 752).

The infection of rats with Bacterium pseudopestis murium and goiter, B. GALLI-VALERIO (*Centbl. Bakt. [etc.], 1. Abt., Orig., 70 (1913), No. 5–6, pp. 278–281, figs. 4*).—This second note confirms and completes the preceding one (E. S. R., 29, p. 58) on the rôle of this organism in the development of goiter in rats.

A system of notation applied to entomological accessions, E. S. TUCKER (*Trans. Kans. Acad. Sci., 26 (1912), pp. 142–145*).—"An explanation of the entire plan for use of symbols may be summarized by steps composing the following course of procedure: All insects contained in an accession are first sorted into superordinal groups as a basis of classification. Each group is then designated by a Roman numeral according to the assignment given. The second step consists in separating the species in each group and indicating each species by a capital letter. In the third step the separate or collective stages of each species are determined, and designated by a small letter, as per assignment. Finally each specimen or pair with respect to one stage, or colony with respect to collective stages, is numbered in consecutive order as desired for special designation. Arabic figures are used for numbering."

[Report of the] Second International Congress of Entomology, Oxford, August, 1912 (*2. Internat. Cong. Ent., Oxford, 1912, vols. 1 (1914), pp. 183, pls. 3; 2 (1913), pp. 489, pls. 32, figs. 28*).—The first volume of this report, by K. Jordan, H. Eltringham et al., consists of the proceedings of the congress; the second volume, edited by K. Jordan and H. Eltringham, of the transactions.

Among the more important papers presented are The Silk of Spiders and Its Uses, by J. H. Comstock (pp. 1–10); The Founding of Colonies by Queen Ants, by W. C. Crawley and H. Donisthorpe (pp. 11–77); Observations on the Central American Acacia Ants, by W. M. Wheeler (pp. 109–139); Progress in Our Knowledge of the Odonata from 1895 to 1912, by P. P. Calvert (pp. 140–157); On the Sense of Vision in Insects, by A. Seitz (pp. 198–204); Observations and Notes on the Geographical Distribution of Some Bloodsucking Insects, by P. Speiser (pp. 205–207); Recent Work in Economic Entomology Carried Out in Western Australia, by N. J. Moore (pp. 221–226); Physiological Investigations of Insect Pests, by J. Dewitz (pp. 234–244); Some Entomological Problems in the West Indies, by H. A. Ballou (pp. 306–317); On Viviparity in Polyctenidæ, by K. Jordan (pp. 342–350); Pellets Ejected by Insect-Eating Birds after a Meal of Butterflies, by C. F. M. Swynnerton (pp. 351–354); Notes on the Aphids of the Cultivated Peas (*Pisum sativum* and *Lathyrus latifolius*) and the Allied Species of Macrosiphum, by F. V. Theobald (pp. 380–393); A Synopsis of the Thysanopterous Family Eolothripidæ, by R. S. Bagnall (pp. 394–397); The Differentiation of Zoogeographical Elements of Continental Regions, by H. J. Kolbe (pp. 433–476); and The Simulium-Pellagra Problem in Illinois, U. S. A., by S. A. Forbes (pp. 477–485).

Sixth annual report of the state entomologist of Indiana, C. H. BALDWIN (*Ann. Rpt. State Ent. Ind., 6 (1912–13), pp. 224, figs. 162*).—This report consists largely of a popular account of insect pests and means for their control. It also includes papers on Some Scale Insects not Heretofore Reported from Indiana, by H. Morrison and H. F. Dietz (pp. 74–78); Some of the More Important Insects Affecting Grains and Grain Products, by H. F. Dietz (pp. 79–105); and Directions for Collecting and Preserving Insects, by H. Morrison (pp. 106–203).

Report of the entomologist's inspection trip to Santo Domingo (*Rpt. Bd. Comrs. Agr. P. R., 2 (1912–13), pp. 25–28*).—This is a report of a trip made by W. V. Tower during April, 1913, to study insect pests and fungus diseases of sugar cane in Santo Domingo.

"La Changa", Scapteriscus didactylus, S. S. CROSSMAN (*Rpt. Bd. Comrs. Agr. P. R., 2 (1912–13), pp. 32–35*).—A brief outline is given of proposed work with *S. didactylus*. The flea beetles *Epitrix parvula* and *E. cucumeris* are said to be important enemies of the tobacco plant in Porto Rico.

Insects of tobacco, J. JOHNSON (*Wisconsin Sta. Bul. 237 (1914), pp. 3–34, figs. 10*).—This is a popular account of the insect enemies of tobacco and the methods of control.

Insect enemies of fruit trees, P. LESNE (*Jour. Agr. Prat., n. ser., 26 (1913), No. 45, pp. 596–600, pl. 1*).—This is a brief account of the more important insect enemies of fruit trees in France.

[Work with cranberry insects in 1913], H. J. FRANKLIN (*Ann. Rpt. Cape Cod Cranberry Growers' Assoc., 26 (1913), pp. 32–42*).—The spanworm referred to in the author's last report (E. S. R., 28, p. 854) as the true cranberry spanworm has been found to differ from that so named by Smith (E. S. R., 15, p. 381). This new spanworm is said to have caused a great deal of damage on a bog at Yarmouth. In studies of its life history, 33 moths emerged between June 6 and June 15 from 42 pupæ collected on August 15, 1912, no parasites being reared therefrom. Barn swallows and tree swallows are said to be important enemies of the adult moths. The dissection of moths has shown at least 295 eggs to be deposited by the most productive and 187 by the least productive.

The experimental work with insects was confined to the flowed bog fireworm (blackhead cranberry worm) and to the cranberry fruit worm. Studies of the fruit worm have shown the braconid *Phanerotoma tibialis* to outnumber all of its other parasites. All parasites obtained from the berries collected at the center of the state bog, all but one of those from the edge of this bog, and about four-fifths of the parasites from the berries collected from the dry bog were of this species. The berries from the dry bog produced nearly three times as many parasites in proportion to the fruit worm moths which emerged as did the berries from the flowed bog. "The time of the greatest emergence of the parasites from the berries from all three locations mentioned was from June 30 to July 9, inclusive. As slightly more parasites than moths emerged from the worms of the berries from the dry bog, it seems highly probable that more than 50 per cent of the fruit worms on that bog last year were killed by these parasites. This shows something of the importance of the natural enemies of this insect which we have been in the habit of considering as being comparatively free from parasites."

P. tibialis was found to deposit its eggs in the egg of the fruit worm. Whether or not the egg of the parasite hatches before that of the fruit worm has not been determined, but the fruit worm when it emerges from the egg carries the small parasite with it. The parasite larva becomes full grown sometime during the winter or spring, and emerging from the fruit worm forms a white cocoon about itself within the cocoon of the fruit worm.

The second most important parasite reared is a small ichneumon which lays its egg in the fruit worm after it has hatched and is working in the berry.

A monograph of the jumping plant lice or Psyllidæ of the New World, D. L. CRAWFORD (*U. S. Nat. Mus. Bul. 85 (1914), pp. IX+186, pls. 30*).—The study here presented has resulted in a complete rearrangement of the genera of Psyllidæ, a family of considerable economic importance. It is stated that while only the American genera were treated in this monograph, yet most of the genera of the world have been considered in connection with the new system of classification here presented. The American genera have been arranged in 6 subfamilies, namely, Liviinæ, Pauropsyllinæ, Carsidarinæ, Ceriacreminæ, Triozinæ, and Psyllinæ. Eight genera and 62 of the species recognized are described as new.

A bibliography of 8 pages is appended.

[Papers on American Hemiptera published by O. M. Reuter], O. HEIDEMANN (*Proc. Ent. Soc. Wash., 16 (1914), No. 2, pp. 77, 78*).—A bibliography of 32 titles is presented.

The scale insects of British Guiana, G. E. BODKIN (*Jour. Bd. Agr. Brit. Guiana, 7 (1914), No. 3, pp. 106–124*).—A preliminary list with an account of their host plants, natural enemies, and controlling agencies.

Arsenate of lead as an insecticide against the tobacco hornworms in the dark-tobacco district, A. C. MORGAN and D. C. PARMAN (*U. S. Dept. Agr., Farmers' Bul. 595 (1914), pp. 8, figs. 2*).—The subject matter of this publication, which deals especially with the advantages of the use of arsenate of lead and gives directions for its use, has been previously noted from another source (E. S. R., 29, p. 356).

It is stated that during the first 9 days of its life the tobacco hornworm eats about $7\frac{2}{3}$ sq. in. of the leaf surface, while during the last 10 to 11 days of its life it eats about $191\frac{1}{3}$ sq. in. This emphasizes the importance of applying arsenate of lead while the worms are small and easy to kill and before they have done much damage.

Studies of the nun moth, M. WOLFF (*Jahresber. Ver. Angew. Bot., 9 (1911), pp. 58–81; Ztschr. Forst u. Jagdw., 45 (1913), Nos. 7, pp. 405–430, pls. 3; 8, pp. 503–522, pl. 1; 9, pp. 537–586*).—A detailed report of biological studies conducted by the author.

The peach twig borer, an important enemy of stone fruits, M. A. YOTHERS (*Washington Sta. Popular Bul. 61 (1914), pp. 4, figs. 5*).—*Anarsia lineatella*, one of the most important enemies of the peach in this country, is said to be a common pest throughout Washington State wherever peaches are grown. During some seasons it causes considerable loss to the growers by destroying the fruit as well as the buds of the trees.

A brief account is given of its life history and of control measures. It is pointed out that it can be reached by a contact spray while in its cell beneath the bark, and that it can be killed by a stomach poison when it begins feeding upon the leaf buds in the spring. The author is of the opinion that where regular spraying with either lime-sulphur or crude oil emulsion for the San José scale is practiced each year as late as possible in the spring when the buds begin to swell the work of this pest will be reduced to a minimum and that further treatment will usually be unnecessary.

Late broods of the codling moth, B. S. PICKETT (*Illinois Sta. Circ. 171 (1914), pp. 7, figs. 7*).—This circular calls attention to the serious loss caused by late broods of the codling moth in 1913 and the need that strenuous efforts be made to combat this insect.

The author recommends as a supplement to spraying that attempts be made to trap and destroy the larvæ. This may be accomplished by furnishing suitable hiding places on the trunk, just above the ground and just below the main branches, where the larvæ will gather in large numbers to make their transformations and may be easily destroyed. Bands made of thick brown wrapping paper and of burlap, which are said to be the most readily available materials, are recommended for use as traps.

Notes on some forest Coleophora with descriptions of two new species, C. HEINRICH (*Proc. Ent. Soc. Wash., 16 (1914), No. 2, pp. 66–69*).—*Coleophora leucochrysella* is reported to have been reared from *Castanea dentata* at Falls Church, Va., and Charter Oak, Pa.; *C. carpinella* n. sp. from Carpinus and *C. alniella* n. sp. from Alnus, both at Hyattsville, Md.; and *C. querciella* from Quercus at Falls Church, Va.

Antimosquito work in New Jersey, T. J. HEADLEE (*Jour. Econ. Ent., 7 (1914), No. 3, pp. 260–268*).—The work in New Jersey, accounts of which have

been previously noted (E. S. R., 29, p. 559; 30, p. 361), is here described under the headings of salt marsh and inland or local mosquito work.

A remarkable outbreak of Culex pipiens, W. E. BRITTON (*Jour. Econ. Ent., 7 (1914), No. 3, pp. 257–260*).—This article records the development of the rain barrel mosquito in edges of a stream at New Haven, and in ponds in the vicinity of Greenwich from which fish had been driven by mill waste, including dyestuffs, etc.

Diptera.—Family Cecidomyidæ, J. J. KIEFFER (*P. Wytsman's Genera Insectorum. Brussels, 1913, No. 152, pp. 346, pls. 15; rev. in Ent. News, 25 (1914), No. 4, pp. 185–188*).—This work lists some 2,500 species and 330 genera from all parts of the world. The review is by E. P. Felt.

The Hessian fly situation in Kansas, G. A. DEAN and J. W. MCCOLLOCH (*Kansas Sta. Circ. 37 (1914), pp. 4, figs. 3*).—A brief popular account based on studies reported in Bulletin 188, previously noted (E. S. R., 30, p. 157).

Ceratopogoninæ sucking the blood of caterpillars, F. KNAB (*Proc. Ent. Soc. Wash., 16 (1914), No. 2, pp. 63–66*).—Following a review of the literature relating to the subject the author presents a description of two new species, namely, *Forcipomyia crucicida* from Florida and *F. crudelis* from Mexico.

The sandfly and pellagra. III, S. J. HUNTER (*Jour. Econ. Ent., 7 (1914), No. 3, pp. 293, 294*).—A brief summary of progress in continuation of the work previously noted (E. S. R., 29, p. 357).

Experiments with house fly baits and poisons, A. W. MORRILL (*Jour. Econ. Ent., 7 (1914), No. 3, pp. 268–274*).—Among the more important conclusions drawn from the experiments conducted are the following:

"Vinegar in itself is an excellent bait for a fly trap, but when used with sugar or bread its attractiveness to flies is greatly increased. Equal parts of vinegar, sugar, and water appear to be approximately as attractive as equal parts of sugar and vinegar. An attractive combination poisonous to flies can be made with formalin and vinegar, but further tests are necessary to determine the best proportions. Formalin (40 per cent) differs greatly on different days in its attractiveness to flies. This variation is evidently not due directly to temperature conditions, and it suggests the possibility of the flies themselves differing from day to day in the degree of the sensitiveness of the sensory organs. . . . Beer, milk, and bread, in the order named, are excellent materials to use with formalin, increasing its attractiveness many times. . . . Commercial alcohol (95 per cent) and water at the rate of 1:20 appears from the experiments to be of about equal value with formalin and water mixed at the rate of 1:10, both as to attractive power and killing effects."

Further observations on the breeding habits and control of the house fly (Musca domestica), C. G. HEWITT (*Jour. Econ. Ent., 7 (1914), No. 3, pp. 281–293, figs. 2*).—This preliminary report of investigations carried on during the summer of 1913 is presented primarily with a view to drawing the attention of other workers to the need of experimental work along similar lines.

Report of an expedition to Africa in search of the natural enemies of fruit flies (Trypaneidæ) with descriptions, observations, and biological notes, F. SILVESTRI (*Bd. Comrs. Agr. and Forestry Hawaii, Div. Ent. Bul. 3 (1914), pp. 176, pls. 25, fig. 1*).—The first part of this report (pp. 13–40) consists of the itinerary of the journey in which the Canary Islands, Senegal, French Guinea, Southern Nigeria, Kamerun, Gold Coast, Dahomey, Congo, Angola, South Africa, Australia, and Honolulu were visited. This is followed (pp. 41–96) by an account of the fruit flies observed during the expedition in Africa, which includes 10 species of Ceratitis, namely, *Ceratitis capitata, C. giffardi, C. silvestrii, C. stictica antistictica, C. punctata, C. anonæ, C. colæ, C. rubi-*

vora, *C. nigerrima*, and *C. tritea;* and 7 species of Dacus, namely, *Dacus oleæ*, *D. armatus*, *D. bipartitus*, *D. lounsburyi*, *D. vertebratus*, *D. brevistylus*, and *D. longistylus*. The hymenopterous parasites and predators of fruit flies next dealt with (pp. 96–128) include 15 species of Braconidæ, 2 of Proctotrupidæ, 6 of Chalcididæ, and 3 of Formicidæ, many of which are characterized for the first time.

The following are a part of the summary and conclusions drawn by the author: "Various species of Ceratitis and Dacus exist in West Africa; some of them, at least in the months in which they were observed, in such reduced numbers as to make it seem certain that they are effectually controlled by natural inimical factors. Certain braconid parasites of the genera Opius, Diachasma, Hedylus, and Biosteres, together with chalcids of the genera Tetrastichus, Dirhinus, and Spalangia, and proctotrupids of the genus Galesus seem to be the inimical factors most active in West Africa against fruit flies. . . . *C. capitata* was found in Nigeria and in Dahomey, but it was extremely rare, at least from November to February. It seems probable that its rarity is due to the action of the same parasites discovered by me for the other species of Ceratitis and Dacus, though it is quite possible that other inimical factors exist. Some species of hymenopterous parasites attack several different species of Ceratitis and of Dacus. Parasites of *C. giffardi* and *C. anonæ* were experimentally bred by me on *C. capitata* and developed to maturity. Living adults of *Opius perproximus*, *Dirhinus giffardi*, and *Galesus silvestrii* from West Africa, *O. humilis* and *Trichopria capensis* from South Africa, and *Diachasma tryoni* from Australia, were brought to Honolulu. Large numbers of the fruit fly parasites, *D. giffardi*, *G. silvestrii*, and *O. humilis* and a few specimens of *D. tryoni* were bred at Honolulu and distributed to other islands of the group. No statements can be made in regard to the results of these introductions until the permanent establishment of the species in question has been proved, but if Opius, Diachasma, Dirhinus, and Galesus become acclimatized a notable destruction of *C. capitata* may be hoped for."

Reports of the breeding and distribution of the parasites introduced by the author for the period from May 16 to September 30, by D. T. Fullaway (pp. 148–153), and that for the period from October 1 to December 31, by J. C. Bridwell (pp. 154–160), and a summary of the records are appended. A bibliography of 15 pages and a complete subject index are included.

The development of blow flies, Stroh (*Berlin. Tierärztl. Wchnschr., 29 (1913), No. 42, pp. 753–757*).—This article deals with *Calliphora vomitoria* and *C. erythrocephala*.

Four new species of Tachinidæ from North America, W. R. Walton (*Proc. Ent. Soc. Wash., 16 (1914), No. 2, pp. 90–95, figs. 7*).—*Polychætoneura elyii* n. g. and n. sp., reared from the red humped apple caterpillar, at East River, Conn.; *Dionea timberlakei*, species of which genus are said to be parasitic on beetles of the genus Cassida in Europe, from Cache County, Utah; *Linnæmyia fulvicauda*, reared from *Remigia repanda*, at Aibonito and Rio Piedras, P. R.; and *Compsilura oppugnator*, reared from *Cirphis latiuscula*, at Rio Piedras, P. R., are described as new to science.

Description of a new species of Agromyża from Porto Rico, J. R. Malloch (*Proc. Ent. Soc. Wash., 16 (1914), No. 2, pp. 89, 90, fig. 1*).—*Agromyza inæqualis* reared from *Vigna repens* (?) at Rio Piedras, P. R., is described as new.

The apple flea weevil, P. A. Glenn (*Trans. Ill. Hort. Soc., n. ser., 47 (1913), pp. 66–78*).—This report of work with *Orchestes pallicornis*, carried on largely from June 10 to 24, includes experiments with arsenical and contact sprays and sticky compounds as control measures.

The pest has been observed in Illinois since 1901 (E. S. R., 13, p. 1063), when it was found injuring apple foliage in various localities in the southern part of the State. In some localities the weevils have been abundant enough to be of considerable economic interest, the injury during the past two years having been quite serious, especially in orchards where the foliage is naturally scanty. The reduction of the leaf surface as a result of the work of the beetle has been variously estimated at from 1 to 50 per cent.

The weevil has been found to be single brooded. "It requires something less than four weeks from the time the egg is laid for the insects to reach maturity. Last year practically all the beetles of the new brood had reached maturity and emerged by June 10. This new brood of beetles is the one that does the injury. It feeds upon the undersides of the leaves for a month or six weeks, from about the middle of May to the first week in July, and then descends to the ground and there remains apparently without food for the remainder of the season and the following winter, to appear again the following spring.

"Since the egg is inserted in the tissues of the leaf and the larval and pupal stages are passed within the leaf where sprays will not reach them, remedial measures must be directed against the adult. The adults of the old brood are to be found on the trees after the first of April, the new brood after the middle of May. If possible, the old brood should be destroyed before April 15 or 20, in order to prevent the deposition of eggs for the new brood."

Arsenate of lead, arsenite of zinc, and ferrous arsenate were experimented with, the last two being less effective than arsenate of lead and both burning the foliage badly. The experiments show "that the beetle is susceptible to arsenical poisons, though perhaps less so than many other insects; that immediate excellent results followed the spraying with arsenate of lead in one case in which starch paste was used to secure an even spread of the spray and special pains were taken to cover thoroughly the undersides of the leaves, but that the spray thus applied did not seem to be effective after 36 hours had elapsed in destroying beetles then on the tree; and that flour paste, soap, lime-sulphur, and perhaps Bordeaux mixture added to the arsenical spray repel the beetles." On June 19 bands of tanglefoot fly paper, 2 in. in width, were placed about 2 ft. from the ground around the trunks of six trees. Five days later 408, 375, 426, 548, 387, and 395 beetles, respectively, were counted.

The most promising experiments were those made with contact sprays. Blackleaf 40 used at the rate of 0.25 oz. in a gallon of water in which 1 oz. of soap had been dissolved was found to be about equal in effectiveness to 5 per cent kerosene emulsion. A 6 per cent kerosene emulsion did not kill the beetles satisfactorily but an 8 per cent emulsion killed them almost instantly. "The contact sprays appear to be the most likely to prove effective, though it is very possible that by beginning early enough and spraying thoroughly enough with the poisons, satisfactory results may be accomplished. In either case the sticky bands will prove useful. If no single method succeeds, there is no doubt that by the combined use of all the methods suggested serious injury may be avoided."

The clover leaf weevil (Hypera punctata), T. H. PARKS (*Jour. Econ. Ent., 7 (1914), No. 3, p. 297*).—This weevil, common in the Eastern States, has recently become abundant in a section of the Payette Valley in southwestern Idaho, where during April, 1914, a field of red clover was eaten to the ground and surrounding alfalfa seriously injured by the larvæ.

The boll weevil problem, B. L. MOSS ([*Birmingham, Ala.*], *1914, pp. VII+95, pls. 5, figs. 9*).—A summarized account of the Mexican cotton boll weevil and its relation to cotton culture, remedial measures, etc.

Feeding habits of the boll weevil on plants other than cotton, B. R. Coad (*U. S. Dept. Agr., Jour. Agr. Research, 2 (1914), No. 3, pp. 235–245*).—This paper, which is based upon studies carried on at Victoria, Tex., during the summer of 1913, deals in large part with feeding experiments with *Hibiscus syriacus*, but also reports briefly upon feeding experiments with *Sphæralcea lindheimeri*, *Callirrhoe involucrata*, and *C. pedata*.

The longevity of the weevils fed on the blooms of *H. syriacus* was found to be much greater than that of those fed on either cotton bolls or leaves and compared well with the longevity on cotton squares. The bloom (stamens and corolla) appears to be much preferred to all other parts. Hibiscus buds do not appear to prolong the life of the weevils.

"It is quite evident that it is possible for *Anthonomus grandis* and *A. grandis thurberiæ* to breed in the buds of *H. syriacus*. And not only is this possible, but all indications point toward the conclusion that this breeding would be no rarity. . . . These data prove beyond doubt that the boll weevils fed from the time of emergence only on the buds and bloom of Hibiscus can develop sufficiently sexually to produce a number of normal fertile eggs and to deposit them normally.

"No boll weevils have been found breeding in plants other than cotton and Thurberia under field conditions, and only one case of feeding under such conditions has been observed. This was in the case of a single boll weevil found feeding on *H. syriacus* at Victoria, Tex., on June 16."

The food of ants, G. Arnold (*Proc. Rhodesia Sci. Assoc., 12 (1913), pt. 1, pp. 11–24*).—The chief sources of ant food are animal food, such as other insects and the carcasses of dead animals, and occasionally the excreta of other animals; the sap and sweet liquids of plants derived from the nectaries of the flowers, from wounds or from fruits, or from the sap in an altered form, as the honeydew, or from similar excretions of other insects which live on the juices of plants; the seeds of plants, bulbs, and the tender roots and cotyledons of seedlings or specialized plant structures, such as Muellerian bodies; and the hyphæ of fungi.

The introduction of parasites of May beetles into Porto Rico, D. L. Van Dine (*Rpt. Bd. Comrs. Agr. P. R., 2 (1912–13), pp. 36–48*).—This report relates to work with parasites of the larvæ of May beetles, carried on from January 1, 1912, to January 1, 1913, under the author's direction by C. E. Hood and G. N. Wolcott, particularly relating to work with species of Tiphia and Elis in Illinois. A brief statement of the work from January 1 to July 1, 1913, is appended.

Notes on the biology of Diplazon lætatorius, E. O. G. Kelly (*Jour. Econ. Ent., 7 (1914), No. 3, pp. 294–297*).—The author has found that the adult female ichneumonid (*D. lætatorius*) oviposits in the eggs of the syrphid *Baccha clavata*, following which the syrphid larva develops to maturity, feeding on *Aphis medicaginis* and pupates, from which stage the adult ichneumonids emerge, having required about 35 days for their development.

"Thus there are now four families of Hymenoptera in which certain forms have this method of parasitism; *D. lætatorius* representing the Ichneumonidæ; *Polygnotus hiemalis* and *P. minutus* representing the Proctotrypidæ; *Chelonus texanus* representing the Braconidæ; and *Tetrastichus asparagi*, *Ageniaspis fuscicollis*, and *Litomastix* (*Copidosoma*) *truncatellus* representing the Chalcididæ."

Concerning some Aphelininæ, L. O. Howard (*Proc. Ent. Soc. Wash., 16 (1914), No. 2, pp. 79–85, fig. 1*).—Among the species here described as new are *Mesidia gillettei*, reared from *Brachycolus tritici*, presumably at Fort Collins, Colo.; *Paraphelinus tomaspidis* n. sp., reared from the eggs of *Tomaspis varia*

in Trinidad; *Physcus fijiensis*, reared from an Aspidiotus at Sava, Fiji; *P. gracilis*, reared from a Lepidosaphes in West Australia; *P. stanfordi*, reared from *Leucaspis kelloggi*, at Stanford University; and *Azotus chionaspidis*, reared from *Chionaspis difficilis*, at Tokio, Japan.

The species of Perilampidæ of America north of Mexico, J. C. CRAWFORD (*Proc. Ent. Soc. Wash., 16 (1914), No. 2, pp. 69–76*).—Among the twelve species here described several are of economic importance, including *Perilampus chrysopæ* n. sp., reared from cocoons of *Chrysopa* sp. at Batesburg, S. C.; and *Chrysolampus lycti* n. sp., a parasite of *Lyctus striatus*. Tables for the separation of the species of the genera Perilampus and Chrysolampus are given.

New parasitic Hymenoptera from British Guiana, J. C. CRAWFORD (*Proc. Ent. Soc. Wash., 16 (1914), No. 2, pp. 85–88*).—A large series of (*Telenomus*) *Prophanurus minutissimus* is said to have been reared from the eggs of *Lycophotia infecta*. *P. alecto* reared from the eggs of the sugar cane borer; *P. thais* reared from the eggs of a large pentatomid; *Aphanurus bodkini* reared from the eggs of *Empicoris variolosus*; *Chalcis pandora* reared from the larva of a hesperid; and *Holocneyrtus calypso* and *Elachertus meridionalis* reared from the larvæ of *Calpodes ethlius* are described as new to science.

FOODS—HUMAN NUTRITION.

The biological significance of the fat content of fish (with special reference to their habitat), O. POLIMANTI (*Biochem. Ztschr., 56 (1913), No. 5–6, pp. 439–445; abs. in Jour. Chem. Soc. [London], 104 (1913), No. 614, I, p. 1409*).—It is pointed out that during the development of fish embryo the visible fat in the body diminishes, and that during this time the habitat gradually changes from that of an organism living on the surface to one living deeper in the water. Numerous analyses were made to determine whether or not nectonic fish, which move rapidly on the surface, usually contain a greater proportion of fat than benthonic or more slowly moving fish. The fat of the fish studied varied from 1.115 to 20.447 per cent of the dry matter, the fish living in deep water having the larger fat content.

A study of the influence of cold-storage temperatures upon the chemical composition and nutritive value of fish, C. S. SMITH (*Biochem. Bul., 3 (1913), No. 9, pp. 54–68*).—From a chemical study of fresh fish (summer flounders or fluke and winter flounders), the author concludes that the proportion of water and ash in the flesh of flounders was not affected by a nine months' period of cold storage and that changes in the proportion of soluble, coagulable, and noncoagulable nitrogenous constituents were negligible, while there was practically no change in the content of ammonium nitrogen.

During this period there was apparently no increase in the acidity of the muscle lipins "for fish with a low content of lipins. . . . There was no production of reducing substance from any constituent of the flesh during any of the storage periods. There was no evidence whatever of any depreciation in the nutritive value, or any change in the sanitary character, of the fish at any time during nine months of cold storage."

A further study of the chemical composition and nutritive value of fish subjected to prolonged periods of cold storage, W. A. PERLZWEIG and W. J. GIES (*Biochem. Bul., 3 (1913), No. 9, pp. 69–71*).—Continuing the work noted above, samples of fish stored up to two years were examined.

The gastric and intestinal membranes of the fish were found to be intact. The abdominal viscera in general were sound and had no odor when handled other than would be noted with fresh flounders.

"The constancy in the data for the yield of ammonium nitrogen, for the reaction of the aqueous extracts, and for acidity of the lipins, shows conclusively that there was no appreciable alteration of the flesh of the fish through bacterial influences. The uniformity in the data for 'soluble' and for 'non-coagulable' nitrogen (making due allowance for the gradual loss of water from most of the fish as the storage period lengthened) shows that there were no appreciable autolytic changes.

"Some of the fish that had been subjected to analysis, including three in storage for two years, were served with meals in conventional ways to a number of people, the authors among them. These portions were palatable and entirely acceptable. The taste was slightly different, perhaps somewhat more 'fishy,' though not unpleasantly so, but otherwise there was nothing to suggest a lack of freshness. . . .

"We do not suggest that our findings would apply in any degree to fish that were not strictly fresh and unspoiled before they were put in cold storage. It is obvious, also, that these results have no bearing on the condition of fish which have been removed from cold storage and kept a week or more in a shop, exposed, until sold, to public inspection during market hours, and iced or kept in a common refrigerator at night. It is equally obvious that these data have no material bearing on the cold storage of anything except fish.

"The results of our studies convince us that fresh fish, similar in general character to flounders, may be preserved frozen, by the best cold storage processes, for at least two years without undergoing any important chemical alteration, and without materially depreciating in nutritive value."

Sterilizing oysters. T. A. BEEL (*Ztschr. Fleisch u. Milchhyg., 24 (1913), No. 2, pp. 31–34*).—A summary and discussion of data regarding the relation of oysters to typhoid fever.

Fish sausage. PUSCH (*Ztschr. Med. Beamte, 26 (1913), No. 16, pp. 601–611; abs. in Hyg. Rundschau, 24 (1914), No. 6, p. 368*).—The author believes that fish sausage is a valuable nutrient and states that, in his opinion, although micro-organisms may not all be destroyed by cooking for ten minutes any which remain would be harmless.

A commercial sausage binder. PETERS (*Ztschr. Untersuch. Nahr. u. Genussmtl., 27 (1914), No. 5, p. 397*).—A commercial product called "schwarten" extract (hide extract) was found to contain no animal material but to consist essentially of agar-agar.

Relative nutritive value of pasteurized and raw milk. I. C. WELD (*Cream. and Milk Plant Mo., 2 (1914), No. 7, pp. 1, 2*).—A slightly greater rate of gain was observed in babies fed on pasteurized milk in comparison with raw milk.

This, according to the author, may perhaps be attributed "to the destruction of certain possible disturbing elements which, if present in milk not perfectly pasteurized, may tend to retard digestion or prevent the fullest possible assimilation of the milk.

"The actual difference in rate of increase in weight of the babies would seem to be convincing evidence that proper pasteurization does not impair the digestibility of milk or cause any possible injury to the nutritive properties of milk that can be detected even when used for infant feeding.

"The decidedly greater rate of increase in weight of the 110 babies when fed on pasteurized milk over the rate of increase of the same babies when fed on raw milk would seem to be corroborative and conclusive evidence that no possible injury to the nutritive properties of milk actually takes place as a result of modern scientific pasteurization and that even the best supplies of raw milk may at times be improved by such a process."

A study of the nutritive value of some proprietary infant foods, RUTH WHEELER and ALICE BEISTER (*Amer. Jour. Diseases Children, 7 (1914), No. 3, pp. 169–183, figs. 30*).—Laboratory animals (young and adult albino mice) were used in this experimental study of four proprietary infant foods. To adapt the material to use by mice each of these infant foods was modified by the addition of purified casein or of the salts of milk (Osborne and Mendel's protein-free milk) or of both. The authors' conclusions follow:

"Two of the four foods seemed to be complete foods . . . allowing maintenance of constant body weight, normal reproduction, and growth more rapid than normal. With [one] a third generation was produced. The other two foods studied . . . did not prove capable of serving as an exclusive ration. One modification of [one] food appeared to satisfy the nutritive requirements for maintenance and for repair in two instances, but not for growth."

Tin poisoning after eating canned asparagus, A. FRIEDMANN (*Ztschr. Hyg. u. Infectionskrank., 75 (1913), No. 1, pp. 55–61; abs. in Chem. Zentbl., 1914, I, No. 1, pp. 58, 59*).—Bacteriological and serological examinations gave negative results, and the poisoning is explained by the tin content of the canned goods, one control sample containing 0.00874 gm. tin per box and the other 0.03428 gm. In the author's opinion the occasional occurrence of such tin poisoning is ascribable to the fact that some persons are especially sensitive to tin.

Analyses showing the composition of the different grades of commercial pack peas, J. C. DIGGS (*Jour. Indus. and Engin. Chem., 6 (1914), No. 4, pp. 310–313*).—Great variations were noticeable in the composition of a pack of peas put up by a single firm under conditions as uniform as possible in factory work.

The variation in the proportion of peas to liquor in the different grades was considerable. "The composition of the liquor of the canned pea is largely determined by the blanching and processing, and as the more mature peas require a longer period, we may expect to find this grade with turbid liquors of high starch and proteid content. The young, immature dried peas contain 18 per cent more water than the oldest grade. The crude fiber decreases from 10.25 per cent to 7.15 per cent on the drained peas, water-free basis. The percentage of sugar seems to decrease with maturity. The reason is not apparent and should be a field for further study.

"The part played by selective absorption in determining the location of added constituents is one requiring further study. The change in ash is very slight. The composition of the ash seems to remain the same throughout the growth of the pea."

[Analysis of citrus fruit juices and of prickly pear products], H. J. VIPOND (*Union So. Africa Dept. Agr. Rpt. 1912–13, pp. 308, 309*).—The author states that determinations were made of the acidity and sugar content of 24 samples of citrus fruits, one sample in each case coming from trees budded on orange and another on lemon stocks.

The prickly-pear products included feeding stuffs, a so-called fertilizer, and prickly-pear vinegar sirups. "None of these showed much promise of usefulness. The sirups, for instance, were devoid of cane sugar, although one of them was labeled 'sugar, ready for granulating.'" The sugar actually present was grape sugar and levulose.

Has caffein-free coffee a diuretic effect, KAKIZAWA (*Arch. Hyg., 81 (1913), No. 1, pp. 43–47*).—From experiments with mice as subjects, the author concludes that caffein-free coffee does not increase diuresis.

Studies of the temperature of beverages, A. FRIEDMANN (*Ztschr. Hyg. u. Infektionskrank., 77 (1914), No. 1, pp. 114–124*).—The author reviews the

literature of the temperature at which foods and beverages are taken into the body and reports the results of a large number of observations.

He states that, contrary to other observers, he has found that beverages are taken in restaurants as well as at home at a temperature of from 50 to 60° C. or higher. Adults, owing to the fact that they are accustomed to taking hot drinks, note temperature differences less acutely than children. According to his observation, children will seldom drink anything with a temperature over 50°, excepting in families where the adults use hot drinks. He believes that neither the climate nor the time of the year is responsible for any increase in the temperature at which beverages are taken.

Annual report of the food and drug commissioner to the governor of the State of Missouri, 1913, F. H. FRICKE (*Ann. Rpt. Food and Drug Comr. Missouri, 1913, pp. 68*).—A progress report is given of the examination of milk and miscellaneous food products, drug products, and other work under the state pure-food law. Out of a total number of 1,006 samples of food and drugs examined, 458 did not meet the requirements.

[Food inspection work] (*Quart. Rpt. Dairy and Food Comr. Va., 1913, Sept.–Nov., pp. 1–45, 54–68*).—Data are given regarding the examination of a large number of samples of miscellaneous foodstuffs and beverages and the inspection of bakeries and other places where food is prepared and sold.

Report of the Royal Commission on Uniform Standards for Foods and Drugs in the States of the Commonwealth of Australia; together with evidence and appendixes, J. A. THOMPSON (*Sydney: Govt., 1913, pp. LXXII+282*).—This report brings together in detail the evidence of traders and manufacturers affected by the pure-food law, which was taken and collected with a view to uniform legislation for the purpose of making regulations in the several States of the Commonwealth of Australia. In the form of appendixes this information is classified and summarized.

Report of the Royal Commission on Uniform Standards for Foods and Drugs in the States of the Commonwealth of Australia, J. W. GREEN (*Brit. Food Jour., 15 (1913), No. 178, pp. 182–186*).—An exhaustive digest of the report noted above.

Physical and chemical tests for the housewife, SADIE B. VANDERBILT (*Teachers Col. [N. Y.], Bul. 16, 4. ser. (1913), pp. 16*).—A number of tests are described which deal with gas and liquid fuels, water, food materials, food adulteration, soap, and soap powders.

Report of the committee on teachers' salaries and cost of living [National Education Association] (*Ann Arbor, Mich., 1913, pp. XX+328*).—This extended investigation has to do with the increased cost of living, the economic and social conditions of teachers in representative cities, and salary schedules, tenure, and pensions. The following quotation shows the attitude of the committee toward the general question:

"While the 15 per cent rise of prices between 1896 and 1903 maye have seemed of minor importance to the earlier committee of the National Education Association on salaries, tenure, and pensions, the subsequent rise has been so large and rapid that, in the opinion of the present committee, it can not be left out of sight for an instant in any discussion or settlement of the question of teachers' salaries."

The nutrition of the people, M. RUBNER (*Trans. 15. Internat. Cong. Hyg. and Demogr. Washington, 1 (1913), pp. 385–407*).—This discussion of the food of the masses is approached, the author states, from a somewhat different standpoint from that of his earlier treatise on a similar subject (E. S. R., 20, p. 662). Nutritive requirements, changes in food conditions and in dietary habits, the merits of different types of diet, relation of food to housing and

other conditions, nutrition in childhood, the feeding of necessitous school children, and similar questions are considered. Suggestions are made for future work.

In closing the paper, which was one of the public addresses at the Fifteenth International Congress on Hygiene and Demography, the author states that "the nutrition of the great mass of the people is a question of the highest importance, deserving far more attention than it has hitherto received. All the great countries ought to have a central authority, a food commission, which should concern itself exclusively with the far-reaching questions of the well-being of the people. The material as it lies before us to-day is very incomplete, but suffices to indicate the main lines of useful work. The nutrition of the masses has so far been most studied with regard to political economy and according to methods and viewpoints which do not always withstand the tests of the physiology of nutrition. Only by means of the physiology of nutrition is it possible to carry on exact research.

"The nutrition of the masses is to us a problem which may be approached and improved from many different sides. It is necessary that not only the hygienists, in the narrower sense, take up the struggle for betterment, but that also the great army of men who are truly humanic in their hearts shall take their places beside us."

People and diet—some questions and solutions, M. Rubner, trans. by E. Bertarelli (*Popolo ed Alimentazione—Quesiti e Soluzioni. Turin, 1913, pp. 180*).—See a previous note (E. S. R., 29, p. 662), covering much the same ground.

Viewpoints in the study of growth, L. B. Mendel (*Biochem. Bul., 3 (1914), No. 10, pp. 156–176*).—Theories of growth, the possibilities of growth, limitations, and other topics are considered in this digest of data on growth and growth phenomena.

Prenatal care, Mrs. M. West (*U. S. Dept. Labor, Children's Bur. Pub., Care of Children Ser. 1, No. 4 (1913), 3. ed., pp. 41*).—Food and diet are among the subjects discussed in this summary of data.

Change of diet in certain skin diseases, Y. Gershun (*Practicheski Vratch, 12 (1913), No. 21, pp. 314–316; abs. in Chem. Abs., 8 (1914), No. 5, p. 955*).—Infants that are breast fed frequently have skin diseases. This is due to the presence of certain poisons in the mother's diet. Psoriasis vulgaris and eczema were often cured by putting the patient on a strictly vegetarian diet.

Studies of beri-beri, X, XI, C. Funk (*Hoppe-Seyler's Ztschr. Physiol. Chem., 89 (1914) No. 5, pp. 373–380*).—Experimental data are reported in refutation of the theory of the toxic origin of beri-beri.

In experiments with pigeons beri-beri occurred at the same time when like amounts of either cooked or uncooked polished rice were fed exclusively. The disease also occurred when a ration of casein, fat, starch, sugar, and salts was fed. Commercial casein contains a trace of vitamin. When this was destroyed by cooking or by extraction with alcohol, beri-beri occurred more quickly than otherwise. An alcoholic extract made from pigeons suffering with beri-beri had a curative effect in the case of others and did not produce any toxic symptoms. Pigeons contracted beri-beri without using up entirely their stored vitamin.

See also previous notes (E. S. R., 29, p. 664; 30, p. 865).

Increased amounts of carbohydrates hastened the incidence of beri-beri, as did also the addition of starch and sugar to a standard diet. This shows that vitamins play an important rôle in the metabolism of carbohydrates and that they have a greater effect in the metabolism of starch than in that of other food constituents.

Zeism or pellagra? P. A. NIGHTINGALE (*Brit. Med. Jour., No. 2771 (1914), pp. 300–302*).—The author describes in detail the pathological conditions noted with prisoners when Indian corn meal, from which the bulk of the bran had been removed in grinding, was used as a staple article of diet in place of ground "rapoko" (African millet) (*Eleusina coracana*), from which the husk had not been removed before grinding.

In spite of many symptoms in common, he does not believe that zeism is the same as pellagra. He states that "sufferers from zeism invariably steadily improved under rapoko meal, until in periods varying from 3 weeks to 7 months they showed no further signs or symptoms of it. . . . Relapses were not seasonal, but occurred only in apparently cured cases that returned too soon to the mealie meal diet. . . . The disease was in no way infectious or contagious." He states further that the prison cooks "never contracted the disease, and that any case suffering only mildy recovered rapidly when working in the kitchen, doubtless on account of the extra titbits that were to be procured there." The similarity of zeism to scurvy or beri-beri is also noted.

Analysis of maize samples in connection with the feeding of mine natives, H. J. VIPOND (*Union So. Africa Dept. Agr. Rpt. 1912–13, pp. 307, 308*).—Ash constituents were determined as well as water and protein in 27 samples of corn. The results according to the author, "although they do not reveal any new feature, . . . show what variations may be expected. The figures for protein are of agricultural interest, as they show the marked superiority of the flint over the dent varieties. The poverty of maize grain in lime is also very strikingly shown."

An experimental study of the relation of food to infection, I, E. THOMAS (*Biochem. Ztschr., 57 (1913), No. 5–6, pp. 456–472*).—Experiments with laboratory animals (pigs) are reported and discussed.

An experimental study of the relation of food to infection, II, O. HORNEMANN (*Biochem. Ztschr., 57 (1913), No. 5–6, pp. 473–491*).—Experiments are reported in continuation of the work noted above. The general conclusion is reached that in comparison with carbohydrates a diet rich in protein had a marked effect in lowering tuberculosis infection.

Infection and diet, E. THOMAS (*Umschau, 18 (1914), No. 10, pp. 195, 196*).—A discussion of the experimental data reported in the above papers.

Experiments on the influence of diet on the resistance to disease made with laboratory animals (pigs) showed that resistance was greatest on a diet containing a relatively large amount of protein. The animals fed the carbohydrate diet were badly affected, one of the animals fed a fat diet being a little and the other decidedly affected, and those fed a mixed diet rather generally affected. The general conclusion reached is that protein affected resistance to tuberculosis favorably and carbohydrate unfavorably.

The influence of underfeeding and of subsequent abundant feeding on the basal metabolism of the dog, S. MORGULIS (*Biochem. Bul., 3 (1914), No. 10, pp. 264–268*).—Under the experimental conditions the carbon dioxid production and oxygen consumption per hour returned to the normal values, as did the rate of respiration and pulsation and body temperature. "There had been no adaptation on the part of the organism to the greater inflow of energy. Its metabolic activity had been temporarily raised while the exhausted organs and tissues had been rapidly repaired, but as soon as the storing away of reserves predominated over the constructive processes, the basal metabolism went back to its original level, the level which was characteristic for this particular organism."

Protein storage in the liver, N. TICHMENEFF (*Biochem. Ztschr., 59 (1914), No. 3–4, pp. 326–332*).—Whether or not one can conclude that there is a storage

of protein in the liver, from his experiments with laboratory animals (mice) and other data the author regards it as certain that the protein content of the liver is much more dependent upon the amount supplied in the diet than is the case with other organs. If it should prove that the protein stored in the liver on a very abundant diet is as quickly used up in subsequent fasting, the stored material can be regarded as a sort of labile protein. The possibility of its being regarded as a reserve protein is also suggested. Further work is promised.

The glycogen content of the liver after feeding protein and protein cleavage products, A. TSCHANNEN (*Biochem. Ztschr., 59 (1914), No. 3–4, pp. 202–225*).—According to the author, the continued supply of protein cleavage products makes entirely different demands on the liver from feeding with native proteids or with a mixed diet. The experiments were made with laboratory animals.

The cleavage of fatty acids in the animal body, M. KOPPEL (*Über den Abbau der Fettsäuren im Tierkörper. Inaug. Diss., Univ. Strassburg, 1913; abs. in Zentbl. Biochem. u. Biophys., 16 (1914), No. 11–12, p. 366*).—The author has studied the cleavage of saturated aliphatic acids of the acetic acid series with a view to determining the first step in the oxidation of fatty acids.

The cleavage of fatty acids in the animal body, L. HERMANNS (*Biochem. Ztschr., 59 (1914), No. 3–4, pp. 333–336*).—This theoretical discussion of fat cleavage is based upon the author's work and that of others.

Evidence of fat absorption by the mucosa of the mammalian stomach, C. W. GREENE and W. F. SKAER (*Amer. Jour. Physiol., 32 (1913), No. 7, pp. 358–368*).—A series or experiments was made with laboratory animals (puppies and kittens), in which the amount of fat in the superficial gastric epithelium and in the gastric glands at different times was studied with relation to feeding and fasting. The main conclusion drawn, according to the authors, is that "there is a definite cycle of variation in quantity of fat in the gastric mucosa and in the different gastric glands in relation to the time following a meal rich in fats."

Chemical and morphological investigations on the importance of cholesterol in the organism.—IV, The cholesterol content of the blood of different animals and the influence of cholesterol intake, especially with the food, L. WACKER and W. HUECK (*Arch. Expt. Path. u. Pharmakol., 74 (1913), No. 6, pp. 416–441; abs. in Jour. Chem. Soc. [London], 106 (1914), No. 615, I, p. 102*).—The relationship of free to combined cholesterol varies and is affected by nutrition, muscular work, breathing, and other factors.

By feeding free cholesterol, the amount in the blood serum was increased and that in the ester form still more increased. The same results were noted when it was administered subcutaneously. The corpuscles, however, were but little affected. In growing animals cholesterol accelerates growth, leading especially to the deposition of fat. Its continued administration leads to disorders of the alimentary canal and to arterial sclerosis.

The experiments were made with laboratory animals.

Chemical and morphological investigations on the importance of cholesterol in the organism.—VI, The influence of muscular work on the cholesterol content of the blood and suprarenal bodies, E. PICARD (*Arch. Expt. Path. u. Pharmakol., 74 (1913), No. 6, pp. 450–460; abs. in Jour. Chem. Soc. [London], 106 (1914), No. 615, I, p. 102*).—With rapid muscular work the amount of cholesterol in the cortex was found to increase, while that in the blood fell slightly.

Muscular work—metabolic study with special reference to the efficiency of the human body as a machine, F. G. BENEDICT and E. P. CATHCART (*Carnegie Inst. Washington Pub. No. 187 (1913), pp. VII+176, pl. 1, figs. 10*).—The

investigations reported were carried out with a special form of respiration apparatus (E. S. R., 21, p. 665), and with a bicycle ergometer described in a previous publication of the U. S. Department of Agriculture (E. S. R., 21, p. 68), and a second instrument which was a replica of it. Two essentially fundamental questions were considered, namely, the character of the material burned in the body before, during, and after muscular work, and the relationship between the amount of productive effective muscular work and the total heat output.

The subjects of the experiments were all young men in perfect health. Four of them were accustomed to bicycle riding, while the fifth, with whom most of the experiments were made, was a well trained professional bicyclist. The experiments were all carried out in the postabsorptive state, that is, at least twelve hours after the last food had been taken. The investigation as a whole covered several months and involved several hundred experiments.

The results showed that during severe muscular work there is a distinct alteration in the character of the materials burned in the body. The evidence indicated a selective combustion of carbohydrate material, though the experiments do not point to an exclusive combustion of carbohydrate during muscular work.

The greater part of the experiments was devoted to a study of the relationship between the total heat output and the effective external muscular work, thereby giving information in regard to the mechanical efficiency of man. The report also takes into account other important questions relative to the muscular work of man, such as the effect of muscular work on the pulse rate, the body temperature, the mechanics of respiration, and the drafts upon the body material, the maximum working capacity of man, and particularly the after-effects of work. A certain amount of evidence was provided by the experiments for a comparison of results obtained with trained and untrained individuals.

Under certain conditions, it is pointed out, particularly when the subject is riding with a moderately severe load and immediately begins riding with a very severe load, it is possible to superimpose a load upon the human body so that 40 per cent of the increment in the total heat output may be in the form of effective external muscular work transmitted to the machine, such as the bicycle ergometer. The experiments gave no indication of the possibility of "overloading" the human machine so far as mechanical efficiency was concerned. Obviously the power of human endurance is limited, but an interesting point brought out is the fact that the professional bicyclist performed all of the experiments without food and that on at least one day he did an amount of work equal to a "century" run over ordinary roads. This experiment gave the data for computations with respect to the probable amount of available glycogen in the human body.

An extensive review of the earlier literature with an analysis of the results obtained by former investigators accompanies the report.

The temperature of expired air and air in the lungs, A. Loewy and H. Gerhartz (*Pflüger's Arch. Physiol., 155 (1913), No. 3–5, pp. 231–244, figs. 3*).—An extended series of observations is reported and discussed.

ANIMAL PRODUCTION.

Introduction to heredity, R. B. Goldschmidt (*Einführung in die Vererbungswissenschaft. Leipsic and Berlin, 1913, 2. ed. rev. and enl., pp. XII+546, figs. 189*).—This volume treats of the theories of inheritance, variation, mutation, hybrids, and other related subjects.

A monograph of albinism in man, K. PEARSON, E. NETTLESHIP, and C. H. USHER (*Drapers' Co. Research Mem., Biometric Ser., 8 (1913), pp. VII+265–524, pls. 33, figs. 3; 9 (1913), pp. VI+136+XXIII, pls. 59; rev. in Nature [London], 92 (1914), No. 2313, pp. 717, 718*).—In this review attention is paid to the need of more clearly classifying the various kinds and degrees of albinism. The original article "gives a full account of the clinical and microscopic characters of various kinds of albinism in the widest sense of the word, both in man and animals; discusses their occurrence and geographical distribution; and includes, in part IV, nearly 700 fully described pedigrees, some of them extending to 100 or more individuals."

Studies of Guam range plants, J. B. THOMPSON (*Guam Sta. Rpt. 1913, pp. 15–17*).—This is an account of the principal grasses, sedges, and miscellaneous plants of Guam that are useful for pasture and feeding purposes.

Analyses of feeding stuffs, P. H. WESSELS ET AL. (*Rhode Island Sta. Insp. Bul., 1914, May, pp. 2–16*).—Analyses are reported of the following feeding stuffs: Meat and bone scrap, cotton-seed meal and feed, linseed meal, gluten feed, malt sprouts, brewers' grains, wheat middlings, bran, hominy chop, corn meal, and various mixed and proprietary feeds.

[Feeding stuffs], W. D. SAUNDERS (*Quart. Rpt. Dairy and Food Comr. Va., 1913, Sept.–Nov., pp. 48–54*).—Analyses are reported of dried beet pulp, rye middlings, oats, linseed meal, cracked corn, cotton-seed meal, wheat middlings, shipstuff, bran, shorts, gluten feed, and various mixed and proprietary feeds.

Chemical analyses of licensed feeding stuffs, 1914, F. W. WOLL and W. H. STROWD (*Wisconsin Sta. Circ. 47 (1914), pp. 3–89*).—Analyses are reported of the following feeding stuffs: Linseed meal, cotton-seed meal, gluten feed, hominy feed, distillers' grains, wheat bran, middlings, red dog flour, germ middlings, rye, barley, and buckwheat feeds, rice meal, rice bran, dried brewers' grains, malt sprouts, alfalfa meal, molasses feeds, and various mixed and proprietary feeds.

There is included the text of the Wisconsin feeding stuffs law, definitions, etc.

Commercial feeding stuffs and fertilizers licensed for sale in Wisconsin, 1914, W. H. STROWD (*Wisconsin Sta. Circ. 46 (1914), pp. 3–21*).—This circular gives a list of commercial feeding stuffs and fertilizers licensed for sale in Wisconsin, 1914, together with definitions of the important feeding stuffs and general instructions to manufacturers and dealers.

Analyses of feeding stuffs (*Jahresber. Landw. Kammer Stettin, Prov. Pommern, 1912, pp. 37–42*).—Analyses are reported of cotton-seed meal, peanut cake, sesame cake, palm kernel cake, cacao meal, rape-seed meal, linseed meal, sunflower-seed cake, soy-bean meal, germ-oil meal, rye bran, wheat bran, barley bran, oat meal, rice meal, molasses feeds, and fish meal.

Feeding principles, W. VÖLTZ (*Ztschr. Spiritusindus., 37 (1914), No. 10, pp. 147, 148, 151*).—In this article the author describes the methods of steaming and ensiling potatoes and potato refuse as well as beets, green corn, and lucern. The composition and digestibility of these materials as determined by several investigators are given. A method of preserving beet leaves, potatoes, etc., by the use of a lactic acid starter is also described, in which the material is placed in trenches, inoculated with *Bacillus delbrücki* and the trench covered with boards and soil.

Animal production, M. HOFFMANN and VON OLLECH (*Jahresber. Landw., 27 (1912), pp. 272–465*).—Recent German publications of investigations on this subject are classified and reviewed.

[Animal husbandry] (*Rpt. Dept. Agr. N. S. Wales, 1913, pp. 9, 47–53*).—This embodies statistics on live stock importations to New Zealand and a report of the sheep and wool industry, including the establishment of stud flocks, the

breeding work being done with longwools and Dorset Horns, and crossbreeding experiments which have been previously noted (E. S. R., 30, p. 372).

Animal feeding, dairy cattle, milk, butter, beef cattle (*Scranton, Pa., pp. IX+[624]+XI–XXIV, figs. 290*).—This volume, which is a part of the International Library of Technology, treats of animal feeding, breeding, and management, and contains chapters on dairy and beef cattle production.

Studies on the work of protein in the intestinal canal, F. A. KRAMM (*Studien über den Abbau der Proteine im Darmkanal. Inaug. Diss., Univ. Leipsic, 1912, pp. 14*).—The author reviews the work of Abderhalden on the work of the protein substances and peptones in the intestinal canal and gives the results of experiments showing the rapid transformation of these substances up to the amino acid stage.

Studies on the passage of drinking water through the stomach, R. OTTO (*Studien über den Transport getrunkenen Wassers durch den Magen. Inaug. Diss., Univ. Leipsic, 1912, pp. 59, pls. 6*).—This reports extended studies made of the passage of water through the stomach of the horse and dog.

[Experiments in animal production] (*Nebraska Sta. Rpt., 1913, pp. XI–XIII*).—This is a summarized account of recent experiments in animal production.

Six lots of cattle were fed upon corn and the following supplements: Lot 1, prairie hay and cold pressed cotton-seed cake; lot 2, corn silage and cotton-seed cake; lot 3, corn silage and prairie hay; lot 4, a heavy ration of corn silage and alfalfa hay; lot 5, a light ration of corn silage and alfalfa hay; and lot 6, alfalfa hay. The respective daily gains per head were 1.92, 2.01, 1.75, 2.24, 2.04, and 2.29 lbs., and the costs per pound of gain 9.53, 9.21, 9.08, 7.76, 8.33, and 7.21 cts., respectively. These results do not correspond with those of earlier experiments and it is purposed to duplicate the work before final results are published.

Four lots of hogs were fed as follows: Lot 1, soaked whole wheat; lot 2, soaked whole wheat and tankage; lot 3, soaked ground wheat; and lot 4, soaked ground wheat and tankage. Wheat was valued at 75 cts. per bushel and tankage at $2.50 per hundredweight. The lots of pigs made a total gain of 705, 825, 1,000, and 1,108 lbs., respectively, costing 8.40, 6.6, 5.84, and 6.06 cts. per pound of gain.

Economical cattle feeding in the corn belt, J. S. COTTON and W. F. WARD (*U. S. Dept. Agr., Farmers' Bul. 588 (1914), pp. 19, figs. 6*).—The authors discuss the cost of producing and of feeding cattle, the care of manure and maintenance of soil fertility, methods of cattle feeding adapted to high-priced and moderate-priced land, use of hogs following cattle, shrinkage, etc.

Cost of beef production under semi-range conditions, G. E. MORTON ET AL. (*Colorado Sta. Bul. 189 (1913), pp. 3–8*).—The object of the experiment here reported was to secure information concerning the cost of producing fat 2-year-old cattle under modified range conditions, the cattle to be run on native grass within fences in summer and to be winter fed.

It is estimated that about 20 acres of range is required per head with ordinary weather conditions. Fifteen head of range-bred 3-year-old cows of Hereford and Shorthorn blood were used in the experiment. These calved in May to July. The 15 calves were brought in on October 20 and winter fed until June 3. The average gain in weight per head was 339 lbs., or 1.63 lbs. daily gain. The amount of feed consumed per head was 2,200 lbs. alfalfa hay and 788 lbs. barley, valued at $13.38, and the cost per pound of gain 3.85 cts. It is stated that these results encourage the liberal winter feeding of range calves.

The yearlings were summer ranged under adverse conditions, and made only 26 lbs. average gain per head. Again they were winter fed, going in September

18 at 658 lbs. per head and coming out April 6 at 1,031 lbs., or an average daily gain of 1.78 lbs. at a cost of gain of 6.85 cts. per pound. The estimated profit per head, over cost of feed and shrink, for the entire 2 years' feeding was $13.47 per head. These figures do not include the cost of labor in winter feeding.

Owing to the adverse conditions under which the experiment was conducted, only general conclusions are drawn from these results. The main profit came in the winter feeding of calves, which bears out the results of earlier work (E. S. R., 23, p. 276). Also "the fattening of the steers as yearlings was a profitable operation, and with reasonable growth on range there is every encouragement for the production of beef in valleys of the State where alfalfa and barley can be grown and there is outside range for the cattle."

A table is included giving information gathered from a selected lot of men running range cattle in different sections of the State and showing estimates of the normal cost of ranging cattle.

Feeding beef cattle. C. A. Willson and S. A. Robert (*Tennessee Sta. Bul. 104 (1914), pp. 77–107, figs. 4*).—Three groups of 2-year-old steers, group 1 consisting of 8 lots comprising 82 head; group 2, 6 lots of 56 head; and group 3, 5 lots of 45 head were fed during a 90-day period corn silage, cotton-seed hulls, and cotton-seed meal in various combinations, the cotton-seed meal being fed in low (3 to 5 lbs.), medium (5 to 7 lbs.), and high (7 to 9 lbs.) daily amounts, respectively. The average daily gains were 1.52, 1.75, and 1.72 lbs. per head, respectively; the average cost per pound of gain 8.53, 8.52, and 12.1 cts.

The general results from the work on cotton-seed meal for steer feeding indicate first, that the best and cheapest gains can be made when the amount of cotton-seed meal fed increases from 5 to 7 lbs. per head throughout the feeding period; second, that the feeder is not warranted in the use of cotton-seed meal to the extent of from 7 to 9 lbs. per head per day, except in very short feeding periods of from 30 to 50 days; and third, that medium meal rations are as efficient from the standpoint of gains as high meal rations, increasing from 7 to 9 lbs. and are much more efficient from the standpoint of economy. In comparing corn silage and cotton-seed hulls as roughage it was found that when small amounts of cotton-seed meal are fed, such as 3, 4, and 5 lbs., silage gives better results than cotton-seed hulls, but that where large amounts are fed the cotton-seed hulls give the bettter results.

On another series of tests, 117 steers fed silage and cotton-seed meal made an average daily gain of 1.72 lbs. per head, 82 on cotton-seed hulls and cotton-seed meal 1.6 lbs., and 32 on a combination of silage, hulls, and cotton-seed meal 1.91 lbs. The average cost per pound of gain was 8.20, 11.3, and 7.6 cts., respectively. These results indicate that much better gains may be made through the use of silage with cotton-seed meal than through the exclusive use of cotton-seed hulls for the roughage portion of the ration. When silage is fed, however, greater gains may be made by the addition of a small amount of some dry feed, such as hulls. The largest and most economical gain was made where a small amount of hulls was fed in conjunction with the silage. The average returns per ton of silage fed are estimated to be $7.65, those of cotton-seed hulls $13.78. From this it is concluded that it requires a much wider margin to feed steers with hulls than with silage.

A study made of the influence of breed on gains showed a gain of 25.6 lbs. in favor of the steers with one or more beef-bred crosses. Not only did the better-bred steers make more gains, but the gains were put on in the more valuable beef cuts, and thus made the beef-bred steers sell at a wider margin and greater profits. Steers classed as very good made an average gain for 90 days of 158.8 lbs.; those classed as good, 143.6 lbs.; medium, 122 lbs.; and poor, 124.9 lbs.

Corn silage and mill products for steers. J. W. WILSON (*South Dakota Sta. Bul. 148 (1914), pp. 332–343, figs. 5*).—This bulletin is a continuation of work previously noted (E. S. R., 27, p. 872).

Three lots of yearling steers of 4 head each were fed during a 146-day feeding period, each lot receiving all the silage the steers would eat and 12 lbs. of a by-product, this being for lot 1 oil meal, lot 2 cotton-seed meal, and lot 3 dried distillers' grains. The average daily gains per head were 2.45, 1.95, and 2.17 lbs., respectively; and during the first ninety days 2.69, 2.08, and 2.49 lbs. The estimated cost per pound of gain was 5.86, 6.64, and 5.5 cts.

In 2 other lots grain was substituted for one-half by weight of the silage fed in the former lots, lot 4 receiving oats and lot 5 corn. The former lot made average daily gains of 2.18 lbs. per head, the latter 2.09, and during the first 90 days 2.3 and 2.01 lbs., respectively, costing 6.88 and 8.22 cts. per pound of gain. The average amount of feed required to produce a pound of gain for the 146-day feeding period was as follows: Lot 1, 19.7 lbs. of silage and 1.2 lbs. of oil meal; lot 2, 21.2 lbs. of silage and 1.5 lbs. of cotton-seed meal; lot 3, 20.3 lbs. of silage and 1.3 lbs. of dried distilled grains; lot 4, 10.9 lbs. of silage and 4.7 lbs. of oats; and lot 5, 11.6 lbs. of silage and 5.9 lbs. of shelled corn.

A chemical analysis, by G. E. Youngberg, of the feeds used is appended.

Results of pasture fattening. CLAUSEN (*Deut. Landw. Presse, 41 (1914), No. 16, pp. 195, 196*).—Oxen from 1 to 4 years old were pastured on various types of pasture. The average daily gains on 100-year-old heavy moorland pasture without manure were 1.45 kg. per hectare, on an 8-year-old light moorland pasture fertilized with stable manure and Thomas meal 1.09 kg., and on a 14-year-old moorland pasture fertilized with offal and Thomas meal, 1.22 kg.

[Color inheritance in Shorthorns]. J. WILSON (*Live Stock Jour. [London], 79 (1914), No. 2085, p. 287*).—The author presents evidence to show that whereas ordinarily when a red Shorthorn and a white breed are crossed there is no possibility of anything but a roan being produced, there is a class of white cattle having red or black points which do not breed like ordinary Shorthorn whites. These are similar to the wild white cattle and are dominant in color to ordinary cattle, breeding like blacks or reds.

How to handle sheep for profit. F. KLEINHEINZ ([*Chicago*], *1913, pp. 25, figs. 12*).—This pamphlet gives practical suggestions for the feeding, care, and management of sheep. There is included an article on Scotch sheep feeding by J. Clay.

Swine, sheep, horses, mules, ponies, asses (*Scranton, Pa., pp. VI+[640]+VII–XVII, pl. 1, figs. 327*).—This volume, which is a part of the International Library of Technology, treats of swine, sheep, horse, pony, ass, and mule breeding and management.

Pasture and grain crops for hogs in the Pacific Northwest. B. HUNTER (*U. S. Dept. Agr., Farmers' Bul. 599 (1914), pp. 27, figs. 9*).—This is a reprint of an earlier publication previously noted (E. S. R., 30, p. 771).

Alfalfa pasture for pigs. L. FOSTER and H. H. SIMPSON (*New Mexico Sta. Bul. 90 (1914), pp. 31, figs. 7*).—Four lots of 8 pigs each were pastured on alfalfa during a 65-day feeding period, lots 2, 3, and 4 receiving in addition 1 lb. grain, 2 lbs. grain, and 8 lbs. skim milk, respectively, per 82 lbs. live weight. The grain consisted principally of wheat. The average daily gain per head was 0.254, 0.66, 0.73, and 0.6 lb., respectively, and the profits per acre of pasture $16.48, $22.39, $16.85, and $19.58.

Three lots of 8 or 9 pigs each, of the Tamworth, Duroc, and Yorkshire breeds, were pastured on alfalfa during a 153-day feeding period and fed supplementary rations as follows: Lot 1, ¾ to 1 lb. corn, lot 2, ¼ to ¾ lb. corn, and lot

3, 5 to 6 lbs. skim milk per 85 lbs. live weight. The respective average daily gains per head were 0.49, 0.38, and 0.41 lb.; the cost per pound of gain 4.75, 4.05, and 3.81 cts.; and the returns per acre of alfalfa pasture, $17.56, $16.33, and $18.44. The low returns per acre of pasture are attributed to the small number of pigs kept on the area, which would have carried one-half more pigs. Tamworth pigs made an average of 75⅓ lbs. gain per head, Durocs 71⅔, and Yorkshires 47. The latter made their best gain on the light grain ration. It is concluded that the greatest profit can be made by running pigs on alfalfa pasture and feeding from ½ to 1 lb. of grain per 100 lbs. live weight per day.

Two lots of pigs, one of 13 Tamworths and the other of 21 Durocs, were pastured on alfalfa during a 126-day period, receiving supplementary feeds of skim milk, bran, and shorts. The Tamworth pigs gained 7.3 lbs. per head more than the Durocs and made their gains at a cost of 0.3 ct. less per pound, thus indicating that they are a little better suited to grazing on alfalfa pasture and to utilizing a bulky ration.

Three lots of 12 pigs each, comprising Duroc, Tamworths, Duroc-Tamworths, and Yorkshire-Tamworths were pastured on alfalfa during a 59-day period, receiving supplementary feeds as follows: Lot 1, 4 to 6 lbs. per head per day of skim milk; lot 2, ¾ to 1 lb. per head per day of ground wheat; and lot 3, 2¼ to 3½ lbs. ground wheat and skim milk, about 1:6. The average daily gains per head were 0.43, 0.57, and 0.51 lb., respectively; the returns per acre of alfalfa, $14.03, $19.11, and $17.15. The breeds ranked in gains as follows: Duroc-Tamworth, Tamworth, Duroc, and Yorkshire-Tamworth. Wheat was found to be a satisfactory and economical supplementary feed for alfalfa pasture, and skim milk a fair supplement, but not worth over 17 cts. per hundredweight where the ground wheat is worth $1.32 per hundredweight. It is estimated that 8.15 lbs. skim milk are equivalent to 1 lb. ground wheat for supplementary alfalfa pasture.

Three lots of 9 pigs each were pastured on alfalfa during a 120-day period, receiving supplementary feeds as follows: Lot 1, 4 to 6½ lbs. per head per day of skim milk; lot 2, 2 to 3⅛ lbs. per head per day of skim milk, together with ¼ to ¾ lb. ground milo maize; and lot 3, 2 to 3⅛ lbs. skim milk and ¼ to ¾ lb. shorts per head per day. The respective average daily gains per head were 0.25, 0.28, and 0.29 lb.; the cost per pound of gain 4.11, 3.5, and 3.64 cts.; and the returns per acre of alfalfa $24.35, $28.82, and $27.88.

The general results indicate that for six months' pasturing, supplemented with a medium ration of concentrated feed, a gain of 782 lbs. per acre may be credited to alfalfa pasture.

Swine husbandry (*Ohio Sta. Bul. 274 (1914), pp. 306, 307*).—Two 3-acre plats of 45 bu. per acre corn were "hogged down" with sixty 76-lb. pigs, all the pigs having access to only one plat at a time. In addition to the standing corn, the pigs received 0.3 lb. of tankage daily per pig and some shelled corn at the beginning and close of the experiment. The pigs made an average gain of 1.51 lbs. daily per pig during the 42 days required to hog-down the 6 acres, and at 6 cts. per pound live weight showed a return of $34.31 per acre for the standing corn.

Second biennial report of the state board of horse commissioners, W. E. Carroll (*Utah Sta. Circ. 17 (1914), pp. 59–74*).—This circular reports the distribution of the breeds of licensed stallions and jacks in Utah. The Percheron breed leads with 31.7 per cent.

British horse breeding, G. T. Burrows (*Breeder's Gaz., 65 (1914), No. 11, p. 592*).—At the annual meeting of the Clydesdale Horse Society of the United Kingdom of Great Britain and Ireland it was reported that 837 certificates for

export animals had been issued, as follows: Canada, 629; United States, 37; South Africa, 51; Sweden, 15; Germany, 1; Russia, 55; South America, 20; New Zealand, 19; and Australia, 10.

It is stated that a keen demand has existed for weighty young geldings of the Shire breed. The demand for the Suffolk from America, Canada, South Africa, and Australasia has been greater than ever. Hackneys have stood still, while there has been some trade in polo ponies and hunters.

Experiments with poultry. R. M. SHERWOOD and W. J. BUSS (*Ohio Sta. Bul. 262 (1913), pp. 515–542, figs. 8*).—In order to secure data relative to the cost of egg production and to the variation in rate and economy of production that may be expected when different lots of fowls are treated alike, four lots of about 50 White Leghorn pullets were fed the same ration for one year and the amount of feed consumed recorded. The average grain and mash consumed per pullet ranged between 67.95 and 70.75 lbs.; the average cost of feed per pullet per year 94.6 and 98.5 cts.; the average gain in weight per pullet 0.177 and 0.376 lb.; the average number of eggs per pullet 117.1 and 125.5; and the cost per dozen of eggs produced 9.17 and 10.09 cts. In another experiment, 5 lots of pullets ranged in average egg production between 104.8 and 141.6 per pullet at an average cost per dozen between 7.62 and 10.77 cts.

Four lots of caponized Barred Plymouth Rocks were fed as follows: Lots 1 and 3 corn, wheat, oats, ground corn, bran, and beef scrap; lots 2 and 4 corn, ground corn, and beef scrap. There was a wide variation in the amount of feed consumed and in the gains made, and hence in the cost of feed per pound of gain, this being respectively 10.95, 9.67, 14.02, and 10.71 cts. The greater cost of lots 1 and 3 was attributed to the variety of feeds in the rations fed these lots. The lots which received corn, ground corn, and beef scrap had a yellower skin than that of the other lots.

A study of the fertility of eggs of 230 fowls shows that the number of fertile eggs began to decrease from 8 to 12 days after mating. In experiments in individual mating the shortest time after mating in which fertile eggs were produced was about 42 hours. The length of time after mating through which fertile eggs were produced varied with different individuals from a little less than a week up to nearly 18 days.

Plans of the poultry buildings at the station are included.

Twelve months' poultry-laying competition, 1912–13, at Harper Adams Agricultural College, Newport, Salop. F. W. RHODES (*Field Expts. Harper Adams Agr. Col., and Staffordshire, Rpt. 1913, pp. 49, pls. 2, figs. 6*).—One hundred pens of six birds each, comprising seventeen breeds of poultry, were represented in this competition, pens of White Wyandottes winning first, third, fourth, fifth, and sixth position; White Leghorns, seventh, eighth, and ninth; and Buff Plymouth Rocks, second. The greatest number of eggs laid by any pen during the entire year was 1,389, and the greatest number by any one hen, 275.

The grain feed used consisted of a mixture made up of dari, buckwheat, hemp, millet, ground peas, ground beans, and corn meal 5 (by measure) : 5 : 1 : 1 : 2½ : 2½ : 5. With this mixture was fed an equal quantity of cracked wheat, cracked wheat and whole oats. A warm mash consisting of biscuit meal, bran, fish or meat meal, middlings, and ground oats 6 : 6 : 3 : 3 : 2, scalded and soaked, was also fed. Vegetables were given in the form of swedes, carrots, and raw chopped onions during the winter, and lettuce, alfalfa, and cabbage during the summer. Green bone, bone meal, and oyster shell were fed as required.

It is estimated that the total weight of eggs laid during the entire year was 9,576 lbs. and the total weight of feed consumed 51,728 lbs., or approximately 5.4 lbs. of dry feed per pound of eggs.

Of the total number of eggs laid, 91,115, 76.46 per cent graded as large, weighing over 2 oz., 23.43 per cent as medium, weighing from 1½ to 2 oz., and 0.11 per cent as small, weighing under 1½ oz.

Of the 554 hens examined as to weight it was found that the light and medium birds proved themselves more prolific than the heavier types.

The real money in eggs, H. A. ROBERTS (*Country Gent., 79 (1914), No. 7, pp. 316, 317*).—A financial account of a 2,000-hen plant, having a total investment of $10,000. Pure-bred and high-grade White Leghorns are used. The average yearly egg production claimed is 144 eggs, the feed cost per hen per year $1.54, and all other expenses $1.06, making a total of $2.60, or 21⅝ cts. per dozen of eggs. The average net price received was 36 cts. per dozen, thus making a profit of $1.72. The manure was valued at 25 cts. per hen, making the total yearly profit per hen $1.97.

The availability of the nitrogen of cotton-seed meal and of beef scrap for chicks, B. L. HARTWELL and R. A. LICHTENTHAELER (*Rhode Island Sta. Bul. 156 (1914), pp. 219–282, pls. 2, fig. 1*).—This bulletin contains the results of eight experiments which conclude the study previously noted (E. S. R., 25, p. 676) of the value of different protein concentrates in the growth of chicks. A comparison was made of the two protein concentrates, beef scrap and cotton-seed meal, both being fed on an equal nitrogen basis.

A pepsin-pancreatin extract made from one of the lots of cotton-seed meal had no harmful effect upon rabbits and hens to which it was fed. The basal ration in these experiments was so deficient in protein that a considerable amount of this ingredient could be added in the concentrates without supplying enough for the maximum growth of the chicks. Hence under these conditions the amount of protein was the main factor in growth, and since the nonprotein constituents of the feeds were usually in such liberal amounts the protein was probably mainly efficient as a source of nitrogen rather than as a source of energy.

It was demonstrated that for the growth of young chicks it is more important within reasonable limits for the amount of protein to be sufficient than that it be associated with a definite proportion of carbohydrates and fat, or in other words that there be a definite nutritive ratio. Analyses of the cooked portions of chicks showed that between the ages of about 4 to 15 weeks the chicks retained about 18 per cent of the nitrogen consumed during that period in the medium protein rations, in which case there was no unnecessary waste of nitrogen. In the majority of cases there was a larger gain in live weight per gram of nitrogen fed in case of the beef scrap than the cotton-seed meal lots, but this is not deemed significant under the conditions.

It is concluded that if "the constituents of bone are supplied, there appears to be no reason why cotton-seed meal may not be used to furnish a considerable portion of the protein required by chicks, especially if a moderate consumption of food is satisfactory to the feeder. If the most rapid growth is desired, regardless of the amount of feed consumed, beef scrap will be found more satisfactory since the chicks consumed more of the beef-scrap ration when allowed to have all they would eat and made a more rapid growth in consequence. When limited to the same amount of nitrogen, however, the gains were not very different whether cotton-seed meal or beef scrap formed a prominent part of the rations."

Rich-colored yolks, C. L. OPPERMAN (*Country Gent., 79 (1914), No. 9, pp. 432, 433, fig. 1*).—Three lots of 40 white Leghorn hens each were fed as follows: Lot 1, yellow corn, bran, gluten meal, beef scrap, 9:6:4:2; lot 2, wheat, bran, wheat meal, beef scrap, 9:6:4:2; and lot 3, wheat, yellow corn, bran, wheat meal, gluten meal, beef scrap, 4½:4½:6:2:2:2. In this test all eggs from pen

1 showed a yolk with a deep yellow color, those from pen 3 had a yolk of good yellow color, and those from pen 2 were noticeably pale in color of yolk.

In a second test in which white corn was substituted for the yellow in pen 1, pens 1 and 2 produced eggs with very pale yolks in all cases but one, and pen 3 a good yellow in all cases. The results of this experiment tend to show that the color of the corn influences the coloring of the yolks and that wheat exerts no influence.

Vitality and activity of sperm cells and artificial insemination of the chicken, L. F. PAYNE (*Oklahoma Sta. Circ. 30 (1914), pp. 3–8, figs. 2*).—The objects of the work reported in this circular were first to study the vitality of the sperm cells of fowls under both laboratory and natural conditions, and secondly to test the possibility of artificial insemination of poultry.

Under artificial conditions the cells did not appear active after 28 hours when kept at body temperature. Cells kept at 34° F. lived from 2 to 3 times as long as those at body temperature. The number of cells per cubic millimeter from five cock birds of approximately the same age ranged between 2,000,000 and 5,000,000.

Virgin pullets were bred and killed at certain periods after breeding and a microscopic examination for sperm cells made of scrapings from the oviduct. It was found that sperm cells pass very quickly from the cloaca to the infundibulum or full length of the oviduct. After the fourteenth day cells in the oviduct appeared to have greatly degenerated. From the fourteenth to the fifty-sixth day the movement in cells was the same and had all the appearance of life, although fertile eggs were not laid more than 16 days after the males were removed. Hens laying infertile eggs were treated artificially with seminal fluid with a resulting fair percentage of fertile eggs.

Standard-bred poultry (*Scranton, Pa., vols. 1, pp. VIII+[385]+IX–XXII, pls. 28, figs. 79; 2, pp. VII+[281]+IX–XVIII, pls. 43, figs. 15*).—These two volumes, which are a part of the International Library of Technology, treat the various breeds of poultry.

Poultry farming (*Scranton, Pa., vols. 1, pp. VIII+[617]+IX–XXXIV, figs. 337; 2, pp. VII+[548]+IX–XXIX, pls. 2, figs. 247*).—These volumes, which are a part of the International Library of Technology, treat of the various phases of poultry breeding and management.

DAIRY FARMING—DAIRYING.

Dutch methods of breeding dairy stock, W. WRIGHT (*Jour. Agr. [New Zeal.], 8 (1914), No. 3, pp. 277–293, figs. 8*).—The author states that there are at present three breeds of native cattle to be distinguished in the Netherlands, the black and white Holland, the red and white Meuse-Rhine-Yssel, and the black white-head Groningen breeds. The body characteristics and measurements of the three breeds are described.

While each group comprises various tribes, families, and types, the typical characteristics of the breeds are constant and permanent. With regard to their relative aptitudes for the accumulation of flesh these groups rank as 40: 50: 55, respectively; as to milking powers, as 60: 50: 45.

It is stated that the fundamental principle of the reorganized Netherland herdbook is the improvement of each of the three native breeds by straight breeding. Animals which do not possess the coat proclaimed typical of one of these breeds are excluded from the herdbook. A rigid system of inspection and of registry is practiced in connection with the herdbook recording. The animals are judged by a prescribed score card especially adapted to each breed.

Care of the dairy bull, C. L. HILL (*Hoard's Dairyman, 47 (1914), No. 17, pp. 623, 628, figs. 2*).—The author presents evidence tending to show that bulls at their maturity are better sires than when young. The records of fourteen of the most successful sires of the Guernsey breed that were kept until mature are given, showing that in the majority of cases their two highest record daughters were sired when the bull was from 4 to 10 years of age.

German dairying, K. FRIEDEL and A. KELLER (*Deutsche Milchwirtschaft. Halle, Germany, 1914, pp. XX+237, pl. 1, figs. 264*).—This book treats of the production of sanitary milk in Germany. Special attention is given to stable construction and to dairy and creamery equipment. The book is copiously illustrated, showing approved modern methods of sanitary milk production and delivery.

Bacteriological and chemical report upon the samples of milk obtained at the milking machine trials, Bishop Auckland, April, 1913, J. GOLDING, R. S. WILLIAMS, and J. MACKINTOSH (*Jour. Roy. Agr. Soc. England, 74 (1913), pp. 247–256*).—In these trials it was observed that the best machines were those in which the teat cups did not depend solely upon suction for their support, those in which the tubes leading from the cups to the can were short and in which rubber and joints were avoided, and those in which cleansing was facilitated. On the whole, the bacteriological content was larger in machine-drawn milk than in hand drawn.

Observations on the bacteriological and chemical examination of the milk supply of Bombay, L. L. JOSHI (*Calcutta, 1913, pp. 20*).—This paper, given at the All-India Sanitary Conference, Lucknow, 1913, discusses the condition of the milk supply in Bombay and gives suggestions for its improvement. An interesting observation made is that "out of 614 samples of milk examined, not a single sample showed genuine tubercle bacilli, from which it may be concluded that tuberculosis is rarely, if at all, conveyed by milk in India."

Bacteriological standards for milk (*Pub. Health Rpts. [U. S.], 29 (1914), No. 20, pp. 1218–1221*).—A list of cities of the United States is given showing the bacteriological standards adopted by these municipalities.

Studies on homogenized milk, A. BURR and H. WEISE (*Molk. Ztg. [Hildesheim], 28 (1914), Nos. 20, pp. 367, 368; 21, pp. 381, 382*).—A difference of from 0.01 to 10 per cent of the fat was found to exist in milk homogenized by the Gerber method over that by the Röse-Gottlieb process. From 3.8 to 7.3 per cent of the total fat content in the milk was retained in raw milk after centrifuging, while from 72.7 to 87.5 per cent was retained in homogenized milk.

Experiments in butter making from whole and mixed milks, E. MATHEWS (*Jour. Roy. Agr. Soc. England, 74 (1913), pp. 276–280*).—It was demonstrated in connection with milk and butter tests at the Bristol Show, 1913, that no advantage in point of weight of butter is obtained in mixing milks showing a large percentage of fat with those of poorer quality. However, the butter made from the mixed milks of different breeds was better both in appearance and in quality than that made from the unmixed milks of these breeds.

Comparing results obtained in churning from differently treated creams, on the average the butter yield ranked as follows: (1) Cream ripened with starters, (2) cream ripened naturally, (3) scalded cream, and (4) sweet cream.

In cheese-making experiments with the different breeds of dairy cattle it was indicated that cheeses made from milks rich in fat are superior in quality.

On the question of the fat building out of protein in the ripening of cheese, K. KONDO (*Biochem. Ztschr., 59 (1914), No. 1–2, pp. 113–165, fig. 1*).—A study was made of the diminution of fats in cheese during the ripening process.

The greatest loss was found to occur after 10 days' storage and to continue thereafter. This decrease did not depend so much upon the duration of the storage period as upon the physical character of the cheese and the temperature of the room. After 15 days' storage the fat diminution varied from 1.04 to 5.37 per cent, and after 40 days from 6.28 to 11.76 per cent. The fat loss depended largely upon the extent of the mold formation, for as this proceeded and covered the surface the amount of fat removed from the cheese was increased. Mold formation ordinarily began after 10 days' storage and increased thereafter.

The fat loss was practically as great when the cheese was thinly coated with paraffin as without. However, if the cheeses are dipped repeatedly in the paraffin bath from the beginning of the experiment the fungus makes very little growth during the storage and the decrease in fat is much less. The formation of mold could not be completely restrained by the paraffin method.

The ripening process and the loss of fat were found to be two wholly independent processes, for the ripening of cheese was as effective in the absence of oxygen-containing air as in ordinary air, but in the former no loss of fats occurred. The characteristic feature of ripening cheese is the cleavage of the casein into the albumoses and peptones, and finally into the amino acids, such as leucin, tyrosin, etc. The extent of this cleavage depends upon the quantity of precipitable and unprecipitable nitrogen present. In the ripening process the presence of the aerobes was found to be indispensable, while that of the anaerobes is yet an unsettled question.

In conclusion, it is stated that in the ripening process of cheese under no circumstances is there an increase of fats, much less a building up of fats out of the proteins. The amount of fat is determined by the growth of a vegetable mold on the surface of the cheese during the ripening process, and it remains wholly unchanged if ripened in an oxygen-free room.

Bacteria concerned in the production of the characteristic flavor in cheese of the Cheddar type. ALICE C. EVANS, E. G. HASTINGS, and E. B. HART (*U. S. Dept. Agr., Jour. Agr. Research, 2 (1914), No. 3, pp. 167–192*).—This work was in cooperation with the Wisconsin Station. The authors summarize the results as follows:

"The organisms constantly found in Cheddar cheese in such numbers as to indicate they must function in the ripening process are included in four groups: First, the *Bacterium lactis acidi*; second, the *B. casei*; third, Streptococcus; fourth, Micrococcus. On the basis of the fermentation powers each of the four groups may be divided into a number of varieties. The distribution of the varieties of the four groups in Cheddar cheese prepared from raw milk has been studied, as has also been done with cheese prepared from pasteurized milk.

"The flora of raw-milk cheese is varied and consists of all the varieties into which the four groups were divided. The flora of pasteurized-milk cheese, with the exception of the *B. casei* group, is dependent upon the flora of the starter. The *B. casei* group is apparently responsible for the pungent taste that develops late in the ripening period of both raw-milk and pasteurized-milk cheeses. It is probable that growth of this group continues during the major part of the ripening period.

"The action of two or more organisms growing together is not the sum of their individual actions when growing alone. When growing together, they may attack substances that neither can attack alone, or they may produce a larger quantity of acid than the sum of the quantities that either can produce alone. When added to pasteurized milk, the organisms of the *B. casei* group produce a sour taste in the cheese during the early part of the ripening period. No Cheddar flavor is obtained in pasteurized-milk cheese when the organisms of the *B. lactis acidi* group alone are used as starters. The varieties that are

able to ferment the more complex substances are likely to produce a bitter taste.

"Starters composed of both *B. lactis acidi*, b, and Streptococcus, b, when added to pasteurized milk, improve the quality of the cheese. It does not seem unreasonable to hope that starters may be obtained that will give the characteristic Cheddar flavor to the cheese prepared from pasteurized milk."

A bibliography of cited literature is appended.

Relation of the action of certain bacteria to the ripening of cheese of the Cheddar type, E. B. HART, E. G. HASTINGS, E. M. FLINT, and ALICE C. EVANS (*U. S. Dept. Agr., Jour. Agr. Research, 2 (1914), No. 3, pp. 193–216*).—This work was in cooperation with the Wisconsin Station. The authors summarize the results as follows:

"Representatives of the coccus groups of organisms isolated from Cheddar cheese when grown in milk produced large quantities of the volatile acids, particularly acetic acid. These acids were produced from citric acid or lactose or protein, as the medium was practically free from fat. These organisms did not produce formic acid. As they are present at times in very large numbers in cheese, they, no doubt, produce much of the volatile fatty acids which arise during the ripening process. One of the strains of Streptococcus, b, was found to produce comparatively large quantities of alcohols and esters—bodies which contribute in a large degree to the flavor of cheese.

"A dilute solution of acetic acid and alcohol formed esters by mere contact, without bacterial action. In cheese, however, the dilution is probably too great for this manner of ester formation. Lactic acid was generally not formed by the coccus groups. The representatives of the *Bacterium casei* group examined gave results different from those obtained from the coccus forms. They produced no formic acid, but did form some propionic and much acetic acid. These organisms produced a large quantity of lactic acid, both active and racemic, and decomposed the citric acid of the media. Cheese made from chloroformed fresh milk did not yield any volatile fatty acids, showing that inherent milk enzyms are not capable of producing these bodies in any appreciable quantity. Representatives of both the coccus and *B. casei* groups were able to produce ammonia from milk. Whey and fresh curds contained active lactic acid. Cheese one day old contained a mixture of active and racemic lactic acids.

"The cause of the disappearance of active lactic acid and the appearance of racemic acid may be due to enzymic action, combined with the action of those bacteria which can produce both kinds of acid. Some representatives of the *B. casei* group produced levo lactic acid and others dextro lactic acid from milk. A mixture of these two varieties produced racemic lactic acid. A mixture of *B. lactis acidi* and a levo-producing member of the *B. casei* group gave racemic and active lactic acid. The active acid was probably the result of the longer continued activity of *B. casei*. Racemic lactic acid found in curing cheese may therefore be produced in a small degree by enzym action, but more probably by the combined action of *B. lactis acidi* and the organisms of the *B. casei* group."

A bibliography of cited literature is appended.

The action of Bacillus bulgaricus in suppressing gassy fermentations in cheese making, C. F. DOANE (*Centbl. Bakt. [etc.], 2. Abt., 40 (1914), No. 9–10, p. 163*).—"It was found that pure cultures of *B. bulgaricus* could be used with perfect results in suppressing the undesirable fermentations, principally gas, which have worried Swiss cheese makers in the past. There seems to be a difference in the efficiency of different strains of *B. bulgaricus* for this purpose without respect to their activity in forming acid. One per cent of a whey

starter made from one culture was sufficient, while it required 3 per cent of another. The *B. bulgaricus* starters could not be seen to have any effect on the formation of the eyes or interfere with the flavor or texture. It is believed that the proper use of *B. bulgaricus* starters will go far toward making a more uniform cheese during the summer months and will make it possible to produce good Swiss cheese during the entire year."

The normal bacteria of Swiss cheese, E. E. ELDREDGE and L. A. ROGERS (*Centbl. Bakt. [etc.], 2. Abt., 40 (1914), No. 9–10, pp. 164, 165*).—The authors made numerous investigations of the bacteria of the cheese of the Emmental type, and a detailed study of their fermentative abilities. Three morphological groups were separated, the long rod, the short rod, and the coccus.

It is stated that "at the beginning of the ripening the bacterial flora consisted almost entirely of the short rods. The long rods appeared in the early stages of the ripening and increased steadily. The short rods decreased and in each of the three cheeses made up about 50 per cent of the bacteria at 7 or 8 weeks, a period corresponding in a general way with the end of the eye formation. Glycerin-fermenting cocci appeared in small numbers in each of the cheeses at an age of 5 or 6 weeks. At the end of 20 weeks the bacterial flora was composed almost exclusively of the long rods."

It is concluded that "the essential bacteria of Emmental cheese are evidently not ubiquitous."

VETERINARY MEDICINE.

Some minute animal parasites or unseen foes in the animal world, H. B. FANTHAM and ANNIE PORTER (*London, 1914, pp. XI+319, pl. 1, figs. 56; rev. in Science, n. ser., 40 (1914), No. 1020, pp. 105–107*).—This is a popular account of the protozoa responsible for diseases of man and animals. The review is by G. N. Calkins.

New remedies: Their composition, action, and use, C. BACHEM (*Neuere Arzneimittel ihre Zusammensetzung, Wirkung und Anwendung. Berlin and Leipsic, 1913, pp. 144*).—This is a compilation of new but chiefly nonofficial remedies, most of which are prepared on the European Continent.

The staining of yeasts by Gram's method, A. T. HENRICI (*Jour. Med. Research, 30 (1914), No. 3, pp. 409–415, pl. 1*).—"It has been shown that yeast cells retain Gram's stain more firmly than the common Gram-positive bacteria. It has been further shown that, unlike the bacteria, the cytoplasm of the yeast cell is not homogeneous with regard to its ability to retain the stain, certain granules appearing in the decolorizing cell which hold the dye longer than others. It is suggested that the ability of these granules to resist decolorization is in direct proportion to their ability to resist autolysis."

The complement fixation test (Gay's modification of the Besredka method) in the differentiation of acid-fast bacilli, W. H. HARRIS and J. A. LANFORD (*Jour. Infect. Diseases, 13 (1913), No. 2, pp. 301–308, table 1*).—It was noted from this work that rabbits injected with whole bacilli or with extracts of the acid-fast group produced antisubstances of a high titer. The whole bacilli, however, produced antibodies of lower potency than those obtained with the Besredka antigen. The Besredka antigen showed the strongest production of antibodies when it was intravenously given at 3-day intervals for four injections. The animals were bled eight days following the last injection. "Regardless of the various methods used to produce these sensibilizators, no clear-cut specificity for complement fixation has been found for the acid-fast bacilli made use of in these experiments."

Alterations produced in complement-containing sera by introduction of lecithin, J. CRUICKSHANK and T. J. MACKIE (*Jour. Path. and Bact., 18 (1913),*

No. 1, pp. 99–113; abs. in Jour. Amer. Med. Assoc., 61 (1913), No. 13, pp. 1074, 1075).—Lecithin is deemed capable of rendering active a component or complement normally present in an inactive or latent state in sera. In the case of guinea pig serum the property of the complement resembles the ordinary middle piece, but differs from it in so far that it is not precipitated by carbon dioxid.

Preparation of nontoxic serum and immune blood preparations (*German Patent 257,977, April 26, 1911; abs. in Chem. Ztg., 37 (1913), No. 41, Repert., p. 188*).—In passive immunization the presence of heterologous proteins is detrimental to animal life and especially when the injections of sera, etc., are repeated. According to this patent specification the toxic action can be eliminated if the immune sera or blood are acidified. It is claimed that by doing this the hemoglobin of the immune blood is transformed into methemoglobin. By autoprecipitation at temperatures varying between 70 to 100° C. the toxic solution can be rendered nontoxic. The autoprecipitation is conducted fractionally, and thereby sera, etc., are submitted at various intervals to certain temperatures for a specific length of time. The procedure is as follows:

From 0.1 to 0.5 cc. of lactic acid is added to immune blood and heated in the water bath at 37°, and after a short time the temperature is raised to 40 to 45°. Between the temperatures of 37 and 54° one-half of the immune fluid is drawn off and the remainder of the blood is heated to 70 to 100°. After it has been held at this temperature for a quarter of an hour the blood is cooled and mixed with the blood or serum which has been drawn off at between 37 and 54°.

The local specific therapy of infections.—I, The biologic basis, S. FLEXNER (*Jour. Amer. Med. Assoc., 61 (1913), No. 7, pp. 447–452*).—An account of the main facts in regard to the biological principles underlying specific therapy in infectious diseases. It constitutes the first Trimble lecture given before the Medico-Chirurgical Faculty of Baltimore, and the Harben lecture given before the Royal Institute of Public Health, London.

Bacteriology and control of acute infections in laboratory animals, N. S. FERRY (*Jour. Path. and Bact., 18 (1914), No. 4, pp. 445–455*).—"From the results of the cultural tests and agglutination experiments as carried out on the micro-organisms included in this study, it is shown very clearly that the *Bacillus bronchisepticus* is a distinct species." The author has encountered but two organisms which may simulate *B. bronchisepticus* in its reactions toward litmus milk and potato, namely, *B. fæcalis alkaligenes* and an organism here described as a bacillus of Group IV.

Antistreptococcus serum, G. H. WEAVER (*Jour. Amer. Med. Assoc., 61 (1913), No. 9, pp. 661, 662*).—"If active antistreptococcus serum is injected into normal guinea pigs in quantities of from 2 to 6 cc. and an interval allowed for its absorption, the blood of the animal comes to contain a considerable amount of demonstrable streptococco-opsonin, and the animal can withstand an amount of highly virulent living streptococci which would promptly kill a control animal. The immunity thus produced is, then, a passive one, since preformed antibodies are injected. It is of short duration, lasting about a week. In animals, antistreptococcus serum has little curative power over an established infection."

This finding was taken advantage of in treating the disease in man. Following the injection a prompt fall in temperature, an improvement in the general toxic condition, a reduction in the number of leucocytes, and a rise in the opsonic index were noted. In this condition there may also be an increased phagocytic activity of the leucocytes.

To secure the best results the serum must be given intravenously, but where the case is not an urgent one it is given intramuscularly or subcutaneously. It

was found that the protective value of serum is in direct proportion to the amount of opsonin present.

Report on foot-and-mouth disease in Ireland in the year 1912 (*Dept. Agr. and Tech. Instr. Ireland, Rpt. Foot-and-mouth Disease, 1912, pp. 74, pls. 29; Vet. Jour., 70 (1914), Nos. 463, pp. 6–23, figs. 6; 464, pp. 57–73, figs. 3*).—This is a detailed report upon the outbreaks of foot-and-mouth disease in Ireland in 1912 and measures taken for its eradication, a brief account of which from another source has been previously noted (E. S. R., 29, p. 677).

About a new serodiagnostic method, W. PFEILER and G. WEBER (*Berlin. Tierärztl. Wchnschr., 29 (1913), No. 25, pp. 449–452*).—It has been found that the conglutination method (E. S. R., 28, p. 478) is on a par with the complement fixation method for diagnosing glanders. In fact, in some cases of glandered horses which were not detected by the complement fixation method the condition was diagnosed by it. It also has the advantage that (1) it is more easily conducted, as it does not require a specially prepared amboceptor, (2) guinea pig serum is replaced by horse serum, which is more easily obtainable and must not be standardized, and (3) the test can be conducted without the use of an incubator. In this work it was found also that neither the presence of complement nor bovine serum containing conglutinins is necessary for the conglutination test.

Theoretically speaking, horse serum contains a substance capable of conglutinating glanders bacilli, and which is consequently similar to Bordet's substance which he terms "colloide de boeuf." It is believed that many of the agglutinins which are present under normal conditions are not agglutinins at all, and, in fact, it seems reasonable to believe that another substance is present whose function it is to combat infection. It was found to be absent in the sera of infected animals and its action is especially noted when the sera of normal animals are heated to 56° C.

The effect of quinin on rabbits inoculated with rabies, L. FROTHINGHAM and J. HALLIDAY (*Jour. Med. Research, 30 (1914), No. 3, pp. 275–280*).—In these experiments neither quinin bisulphate nor quinin and urea hydrochlorid, dissolved in water and administered subcutaneously, had any curative effect upon rabbits which showed symptoms of rabies after intracerebral, subdural, and intramuscular inoculation with street virus. The injections caused a local reaction with necrosis and, in the control rabbits, subsequent sloughing.

The quinin treatment of rabies, J. G. CUMMING (*Jour. Infect. Diseases, 15 (1914), No. 1, pp. 205–208*).—"Inasmuch as the quinin failed as a preventive measure against extremely small doses of virus in actual tests, can it not reasonably be assumed that this method of treatment is of no curative value in cases of hydrophobia manifesting symptoms in which the amount of virus would be many thousand times greater?"

The duration of passive immunity against tetanus toxin, E. H. RUEDIGER (*Philippine Jour. Sci., Sect. B, 8 (1913), No. 2, pp. 139–142; abs. in Berlin. Tierärztl. Wchnschr., 29 (1913), No. 39, p. 696*).—The subcutaneous injection of 1,500 units of (horse) tetanus antitoxin produces a passive immunity in horses in about 6 to 8 weeks. If normal horse serum is repeatedly injected into guinea pigs and the injection followed with antitoxin, the immunity produced in these animals is greater than in animals which have received no horse serum.

New observations upon the trombidiasis of goats and its transmission to man, B. GALLI-VALERIO (*Centbl. Bakt. [etc.], 1. Abt., Orig., 72 (1914), No. 6–7, pp. 488–490, figs. 2*).—In this paper (E. S. R., 31, p. 284) the author reports that the larvæ of *Microtrombidium pusillum*, which cause the trombidiasis of goats in Valtelline, also cause a cutaneous eruption in man which is accompanied by violent itching.

Investigations in regard to the tuberculosis problem. LYDIA RABINOWITSCH (*Deut. Med. Wchnschr., 39 (1913), No. 3, pp. 103–106; abs. in Ztschr. Fleisch u. Milchhyg., 23 (1913), No. 20, p. 474*).—On injecting the bile from seventeen tuberculous subjects into guinea pigs, that of twelve produced tuberculosis in these animals. With the antiformin and microscopical methods only one case yielded positive findings, consequently it is concluded that the gall bladder is a source of elimination for the tubercle bacillus and must be reckoned with when dealing with preventive measures for this disease. Six strains of organisms isolated were more closely examined, and four belonged to the human and two to the bovine type. The author considers these results as confirmatory of the findings of Schroeder and Cotton (E. S. R., 19, p. 181) and Joest and Emshoff (E. S. R., 29, p. 582).

The virulence of the tubercle bacilli in the so-called "rayed caseation." HAFEMANN and BINDER (*Ztschr. Fleisch u. Milchhyg., 23 (1913), No. 23, pp. 529–531*).—A continuation of the work previously noted (E. S. R., 30, p. 882). The tubercle bacilli obtained from the rayed foci were found to be very virulent.

A contribution to the occurrence of primary pudic and vaginal tuberculosis in the bovine. W. MEYER (*Ztschr. Fleisch u. Milchhyg., 22 (1912), No. 10, pp. 303–306, fig. 1; abs. in Centbl. Bakt. [etc.], 1. Abt., Ref., 56 (1913), No. 7, p. 201*).—A description of a case, the identity of which was established by vaccinating rabbits with some of the tuberculous material. This affection as of man is rarely observed in animals.

The diagnosis of tuberculosis with the anaphylactic test in vitro. A. TADINI (*Pathologica, 4 (1912), No. 98, pp. 719–721; abs. in Ztschr. Immunitätsf. u. Expt. Ther., II, Ref., 6 (1913), No. 15, p. 1112*).—By injecting into a rabbit a mixture from a tuberculous subject consisting of tuberculin and serum which has been kept in the incubator for two hours, or a control injection of normal serum and tuberculin, no anaphylactic phenomena were ever noted. Likewise no effect was produced by injecting normal or tuberculosis serum alone into rabbits, except in two animals, one of which received tuberculosis serum and the other a normal serum, and which is explained as due to the toxicity of the serum. A passive conveyance of anaphylaxis from a tuberculous subject to an animal is not deemed possible.

The diagnosis of tuberculosis with the anaphylaxis reaction. F. VALENTI (*Pathologica, 4 (1912), No. 91, pp. 488–490; abs. in Ztschr. Immunitätsf. u. Expt. Ther., II, Ref., 6 (1913), No. 15, p. 1110*).—The results were very satisfactory when conducted by a procedure different from that of Yamanouchi's. Further tests should be made with it, however, in order to determine its value as a diagnostic agent.

The thermoprecipitation reaction in tuberculosis. A. FAGIUOLI (*Pathologica, 4 (1912), No. 89, pp. 410, 411; abs. in Ztschr. Immunitätsf. u. Expt. Ther., II, Ref., 6 (1913), No. 15, p. 1112*).—The sputum was mixed with physiological salt solution, boiled, and then filtered through asbestos, or the extract was mixed in the cold with concentrated acetic acid, neutralized, and filtered through a bisque filter and paper. The specific serum used was Vallée's. The layer test was characteristic but it was not specific for tuberculous subjects.

A reaction was obtained also with sputum from subjects affected with pneumonia and simple bronchitis.

Tuberculous antigens and antibodies.—Inhibition reaction. A. CALMETTE and L. MASSOL (*Compt. Rend. Soc. Biol. [Paris], 75 (1913), No. 28, pp. 160, 161*).—By introducing a stream of carbon dioxid into an inhibiting serum diluted 1:10 with distilled water, a precipitate is obtained which shows precipitating and inhibiting properties greater than those of the original serum. On the other hand the serum, after removal of the precipitate, while robbed of

most of its inhibiting properties, retains its agglutinins and sensibilisins, and these can be more easily detected.

The reciprocal affinity of tuberculins prepared from tubercle bacilli obtained from man, bird, fish, and Rabinowitsch's bacillus, E. CARAPELLE (*Biochim. e Terapia Sper., 3 (1912), pp. 357–367; abs. in Ztschr. Immunitätsf. u. Expt. Ther., II, Ref., 6 (1912), No. 11, pp. 874, 875*).—It was the object of this work to determine whether the various tuberculins contain the same principle, and if so, whether this principle produces the same antibody. After determining the minimal fatal dose of each of the tuberculins for guinea pigs, animals were immunized with increasing doses. The sera of the animals were then tested for their content of opsonins, agglutinins, complement fixing substances, and meiostagmins.

The tuberculin prepared from the acid-fast strain of Rabinowitsch's bacillus had a different behavior toward the various biological reactions than any of the other preparations, i. e., Wright's positive and negative phase did not appear. The human, avian, and fish tuberculins produced amboceptors and agglutinins in the serum which behaved alike toward the opposite strains, and consequently it is concluded that all of the organisms produced the same antibody. Evidently a strong affinity exists between the various tuberculins. Meiostagmins were not noted in the blood of the various guinea pigs.

Guinea pigs infected with the organism of human tubercle bacilli, followed by treatment with small doses of tuberculin, died 25 days later than the controls. If tuberculin is given first, the conditions are reversed.

The production of passive hypersensitiveness to tuberculin, C. R. AUSTRIAN and H. FRIED (*Bul. Johns Hopkins Hosp., 24 (1913), No. 271, pp. 280–282*).—The results confirm the established fact that free sensibilisin can not be demonstrated in the blood of most individuals affected with pulmonary tuberculosis. The anaphylactic nature of the tuberculin reaction was shown.

Proposal for an extension of the measures for combating mammary gland tuberculosis in bovines in Sweden, A. M. BERGMAN (*Ztschr. Fleisch u. Milchhyg., 23 (1913), No. 10, pp. 217–219*).—After showing that tuberculosis of the udder is still on the increase in Sweden and Denmark, various recommendations are made with a view of detecting this condition at an early date. It is considered essential that dairy animals be examined at least four times a year by competent veterinarians.

[Periods of high temperature in cattle imported into Guam], J. B. THOMPSON (*Guam Sta. Rpt. 1913, pp. 9–11, figs. 4*).—The author presents temperature charts which show the periods of high temperature that have occurred in imported cattle. In some instances these fever periods have not been marked by excessively high temperature and have been of comparatively short duration. On the other hand, cases have been dealt with in which the temperatures have risen above 107° F., and the period prolonged for more than a week.

Experimental bovine mastitis produced with hemolytic streptococci of human origin, D. J. DAVIS and J. A. CAPPS (*Jour. Infect. Diseases, 15 (1914), No. 1, pp. 135–140*).—"Hemolytic streptococci of human origin may cause mastitis, lasting for several weeks in cows. This time roughly corresponds to the duration of milk-borne epidemics. The streptococci may gain entrance through an abraded or injured surface of the teat. It appears possible, therefore, for mastitis in cows to be produced by an infection from the milker whose hands are contaminated perhaps from a sore throat. Mastitis results promptly when the cocci are injected directly into the udder by means of a catheter. The mastitis may exist without physical evidence. A caked bag may not occur, though pus and streptococci in large numbers are being secreted in the milk.

Stringy, ropy, or gargety milk may or may not occur during the course of the mastitis.

"In order to detect such infections, it might be necessary to examine milk from each quarter for bacteria and for pus. This may explain the failure to detect the source of the streptococci in some of the epidemics of sore throat. No change was noted in the cultural or pathogenic properties of the streptococci after growing in the udder of a cow for four weeks. The presence of various contaminating bacteria tend to inhibit the growth of hemolytic streptococci in milk."

The formation of arsenate in dipping tanks, J. LEWIS (*Agr. Jour. Union So. Africa, 7 (1914), No. 5, pp. 658–664*).—In the first part of this paper the literature relating to the subject is briefly reviewed. In a large number of analyses made by the author of dips only four contained appreciable quantities of arsenate. The studies lead to the conclusion that in tanks in use the conflicting activities of the arsenate formers and the arsenite formers result in the liquid being kept sufficiently constant in composition for all practical purposes. The author's advice is to continue using a dip unless there is strong evidence that it has altered in composition.

The seventh annual report of the state veterinarian of Alabama, 1913, C. A. CARY (*Ann. Rpt. State Vet. Ala., 1913, pp. 50*).—This reports upon progress and results of cattle tick eradication, gives directions for testing dips in dipping vats for active arsenious acid, discusses hog cholera and its prevention, etc.

Erysipelas in hogs and its relation to swine plague, W. RIEBE (*Der Rotlauf der Schweine und seine Wechselbeziehungen zur Schweineseuche. Inaug. Diss., Univ. Giessen, 1911, pp. 56; abs. in Hyg. Rundschau, 23 (1913), No. 12, pp. 740–742*).—Aggressins may be produced in rabbits infected with agar cultures of the *Bacillus erysipelatis*. The swine plague aggressins act aggressively upon the erysipelas bacteria, and mice vaccinated by the simultaneous method after receiving swine plague aggressins die from acute erysipelas. Erysipelas exudates act aggressively on swine plague bacteria and a nonlethal erysipelas infection is made lethal by the administration of artificially prepared swine plague exudates.

For preparing sterile aggressins the erysipelas bacteria in the exudates are killed with vapors of formaldehyde. Heating to 44° C. will not suffice for preparing the aggressin because it requires four days to kill this organism at this temperature. With formaldehyde it requires only four hours. Artificially prepared erysipelas aggressins are toxic in large doses; erysipelas exudates are not. The pericardial fluid of pigeons which have died from erysipelas has not the aggressive properties.

By exposing erysipelas bacteria, isolated from the spleen and kidneys, on slides for fourteen days to sunlight the virulence for mice is lost. If kept from the light, however, and stored in a cool place, the bacteria are still virulent for mice after four weeks. The right half of the heart is more often infected than the left. The valvular infections (endocarditis verrucosa) were in the following order of frequency: (1) Bicuspid, (2) tricuspid, (3) aortic, and (4) the pulmonary valves. In the course of the tests a diplococcus causing endocarditis was noted which was pathogenic for mice. The verrucose material of the heart valves was usually pathogenic for mice, but viruses often occur which show a diminished virulence. In thrombosis of the valves avirulent forms of bacteria of granular consistency were noted in 7 out of 28 cases.

The organs of pigs which died from endocarditis showed virulent bacteria, and out of 28 cases the bacterium was noted in 14 cases by microscopical methods and animal inoculation tests. In the remainder the organism could

not be detected. At times the material obtained from the heart valves was not infectious, while that from the organs was. When the heart valve vegetations and organs were infectious, they killed pigeons much sooner than mice.

Hog cholera. H. P. HOSKINS (*Univ. Minn., Dept. Agr., Ext. Bul. 37 (1913), pp. 16, figs. 9; Amer. Vet. Rev., 43 (1913), No. 5, pp. 473–496, figs. 9*).—This is a popular description of hog cholera, with noteworthy illustrations. It deals with the distribution of hog cholera in the United States, the symptoms, pathology, diagnosis, prognosis, and treatment of the disease, and enumerates and describes diseases which are often mistaken for hog cholera. The methods utilized for preventing the spread of hog cholera, the serum treatment, the serum-virus method and its value, and the preparation of serum are all described.

Influence of the mode of penetration, cutaneous or buccal, of Stephanurus dentatus on the localization of this nematode in the body of swine and on its development. P. N. BERNARD and J. BAUCHE (*Ann. Inst. Pasteur, 28 (1914), No. 5, pp. 450–469, pl. 1, figs. 2*).—A more detailed report of investigations substantially noted from another source (E. S. R., 29, p. 783).

Fistula of the withers: Autotherapy. W. A. DUFFIN (*Amer. Vet. Rev., 43 (1913), No. 4, p. 406*).—A case in a mare treated for fistula of the withers, which was caused by rubbing of the collar, is described. See also a previous note by Duncan (E. S. R., 29, p. 175).

Bacillary white diarrhea of young chicks. L. F. RETTGER, W. F. KIRKPATRICK, and R. E. JONES (*Connecticut Storrs Sta. Bul. 77 (1914), pp. 263–309, pls. 2, figs. 15*).—This fourth report of investigations of bacillary white diarrhea (E. S. R., 29, p. 288), which deals with the carrier problem, the macroscopic agglutination test as an important aid in the diagnosis of ovarian infection in adult fowls, and milk feeding and its influence on growth and mortality, has been summarized as follows:

"Female chicks which are infected with *Bacterium pullorum* when small may develop into permanent bacillus carriers and be a constant source of danger to young and old stock. This carrier condition may be established in fully 25 per cent of an infected flock. Thus, the last link in our proposed cycle of infection has been experimentally proved.

"The macroscopic agglutination test devised by F. S. Jones [E. S. R., 28, p. 887] is an important aid in the recognition of bacillary white diarrhea infection in laying hens.

"Sour milk feeding has a most beneficial influence on the growth of chicks and in lessening mortality from all causes. As an important agent in the prevention and suppression of white diarrhea its value is somewhat doubtful, and further investigation is necessary before unqualified statements can be made. Milk which is soured by the *bulgaricus* bacillus of Metchnikoff possesses no distinct advantages over naturally soured milk; on the other hand, it has several disadvantages. Its method of preparation involves considerable time and care, and it is not relished by chicks to the same extent as naturally soured milk."

An appendix discussing the importance of breeding from sound, uninfected stock, symptoms and post-mortem appearances of the disease, its detection by the examination of the ovaries, and the importance of bacteriological examinations, with a description of *B. pullorum*, is given.

Ovarian infection in the domestic fowl and direct transmission of disease to the offspring. L. F. RETTGER (*Jour. Expt. Med., 19 (1914), No. 6, pp. 552–561*).—The data here presented are based upon the investigation above noted. The author summarizes the study as follows:

"Ovarian infection and germinal transmission of disease have been conclusively demonstrated. . . . The disease . . . primarily affects young chicks

that are but a few weeks old. Chicks which survive frequently become permanent bacillus carriers, the ovary being the important seat of infection. The eggs from such carriers often harbor the organism of the disease in the yolk. Chicks that develop in infected eggs become in turn infected, and have the disease at the time of hatching. The disease is transmitted to normal chicks through the infected droppings; thus an epidemic is produced, and the cycle of infection is completed.

"There is no evidence to indicate that germinal transmission through the male takes place. In view of the frequent negative results bearing on this question it seems probable that it does not."

Studies on fowl cholera.—III, The inheritance in rabbits of immunity to infection with the bacterium of fowl cholera, P. B. HADLEY (*Rhode Island Sta. Bul. 157 (1914), pp. 285–307*).—This continuation of the work previously noted (E. S. R., 27, p. 583) has been summarized as follows:

"Female rabbits, immunized by inoculation with an avirulent culture of the fowl cholera bacterium are able to transmit to their offspring a high degree of resistance to virulent cultures. Some immune mothers are able to produce such immune offspring for at least more than 2 years and 3 months after the date of their immunization. Immunity is not transmitted by the immune male. The resistance in the offspring is not permanent, enduring for not more than 40 days. This inherited, passive resistance can be transformed into a durable, active resistance by inoculating the young animals, sometime within the first 40 days of life, with a virulent culture."

A bibliography of the cited literature is appended.

A note on the occurrence of spirochetosis of fowls in Southern Nigeria, J. W. S. MACFIE and J. E. L. JOHNSTON (*Ann. Trop. Med. and Par., 8 (1914), No. 1, pp. 41–48, pls. 2*).—This records the occurrence of this disease in Southern Nigeria.

On certain spontaneous chicken tumors as manifestations of a single disease (*Jour. Expt. Med., 19 (1914), No. 6, pp. 570–580, pls. 6*).—The first paper, by P. ROUS (pp. 570–576), deals with spindle-celled sarcomata rifted with blood sinuses; and the second paper, by Linda B. LANGE (pp. 577–580), with simple spindle-celled sarcomata.

RURAL ENGINEERING.

Flumes and fluming, E. S. BRUCE (*U. S. Dept. Agr. Bul. 87 (1914), pp. 36, pls. 9, figs. 7*).—This bulletin discusses the use of flumes in lumbering operations, and describes the most salient points of their construction.

The author considers the V-shaped type of flume to be the most generally used and generally satisfactory for the transportation of manufactured lumber or timber in its different forms. The right angle is said to be the most satisfactory form of V box construction for all purposes. Many different methods and styles of construction are used in building V-shaped flumes, the sections of which vary in length from 6 ft. up to 20 ft. More commonly the lining of boxes is constructed of two thicknesses of boards with the joints broken by varying the width of the boards. "For railroad crossties, cants, poles, cordwood, etc., the 30-in. flume is usually large enough, wherever there is a sufficient volume of water available to fill the flume two-thirds full, while for the handling of logs, piling, long timbers, or 'brailed' sawed lumber it is usually advisable to have the flume constructed with the sides of the V from 40 to 60 in. in height, according to the volume of water available and the size of the material to be handled."

In flume construction it is considered advisable usually to erect a small sawmill to saw out the lumber needed for construction. An accurate and careful survey of the proposed line of flume construction is considered a prime necessity, particularly as regards grades and curves. In general, the lowest grade considered satisfactory for successful operation is about 1 per cent, and the most satisfactory results are obtained when the grade is from 2 to 10 per cent, with a maximum of 15 per cent. The degree of curvature should be kept as low as practicable with a usual maximum of 20°. Where the topographic conditions in a locality are such that abrupt curves in the flume are absolutely necessary, it is considered advisable to reduce the length of the boxes, and correspondingly shorten the distance apart of the bents, arms, and braces, and to increase or raise the height of the V on the outside of the curve. The most satisfactory distance between bents is said to vary from 12 to 16 ft., according to the capacity of the flume and the use to which it is to be put. "Flume construction should usually be strongly reinforced at those points from which it is contemplated to do extensive shipping or where such material is to be loaded into the flume over the side."

Other general information is given regarding feeders for maintaining the required amount of water, tunneling, small holding reservoirs at different points of flume, reservoir ponds at the head of flumes, branch flumes, switches, the use of telephones in flume operation, and cost of construction of flumes. Tabular data on the weight of water in a 16-ft. section of flume when filled to various depths, amount of water required to fill flumes, and velocity of water in flumes when filled to various depths at different grades, and estimates of the approximate amount of material required for the construction of typical flumes are given.

The use of coordinates in surveying and laying out tracts for irrigation, H. H. LOGAN (*Engin. News, 71 (1914), No. 14, pp. 738–740, fig. 1*).—This method is described and illustrated.

Soil porosity and the distance between drainage channels, L. SCHMEER (*Engin. and Contract., 41 (1914), No. 13, pp. 398, 399, figs. 2*).—The author, by means of formulas and tabulations, deduces values of the transmission constant for soils, noted in previous work (E. S. R., 30, p. 289), as modified by humus in the top layers of the soil.

The road drag and how it is used (*U. S. Dept. Agr., Farmers' Bul. 597 (1914), pp. 15, figs. 8*).—The purpose of this paper is to describe the best methods of constructing and using road drags and to supply information concerning the conditions for which such drags are adapted. The principal points discussed are summarized as follows:

The road drag is the simplest and least expensive contrivance yet devised for maintaining roads constructed of earth or earthy material. Its successful operation depends to a very great extent on the skill and intelligence of the operator. The time to use the drag is when the material composing the road surface is sufficiently moist to compact readily under traffic after it has been moved by the drag and when it does not contain sufficient moisture for the traffic following the drag to produce mud. Dragging can not usually be so arranged as to keep teams employed all the time, making it desirable to have it done by interested persons who are otherwise employed when not engaged in dragging.

It is further pointed out that the road drag is essentially a maintenance implement, that its use in construction is distinctly secondary, and that roads which are very rocky or very sandy can not be materially improved by its use.

An outfit for boring taprooted stumps for blasting, H. THOMPSON (*U. S. Dept. Agr., Farmers' Bul. 600 (1914), pp. 5, figs. 4*).—This publication gives

detailed information concerning a power outfit for boring taprooted stumps for blasting.

To get the best results when blasting such stumps, the charge must be placed within the taproot. The power outfit consists of one 5-horsepower horizontal gasoline engine, one 3-kilowatt dynamo, two electric drills using 1½-in. augers usually 30 in. in length, and the necessary cables for connecting. The engine and dynamo are mounted upon skids or a wagon and the drills are supplied with current from the dynamo. The total cost for an electric stump boring outfit f. o. b. distribution point is given as $460.

In a test of such an outfit the dirt was thrown away from one side of the stump to a depth of 12 in. and a hole bored into the stump at least 10 in. below the surface. Of the 100 stumps so blasted 97 were broken off below plow depth while the roots of the remaining 3 were easily cut out low enough to permit cultivation. Slightly less powder was used than where the holes were bored at the surface of the ground and the total average cost for digging, boring, and blasting was 22 cts. per stump. The cost of clearing land with this outfit and the use of nitroglycerin powder will range from $5 to $18 per acre provided the wood from the stumps and roots can be sold for enough to pay for their disposal.

Scientific tests of a two-cylinder opposed engine, B. HEER (*Gas Engine, 16 (1914), No. 3, pp. 137–141, figs. 6*).—Tests of a two-cylinder opposed engine rated at 10 horsepower are reported. In one and two hour tests at full load, the engine had a mechanical efficiency of 82.67 per cent and a thermal efficiency of 23.76 per cent. The heat losses were in the cooling water 47.6, exhaust 11.4, and radiation 17.04 per cent. After a steady 130-hour run at full load the mechanical efficiency was 83.7 per cent and the thermal efficiency 21 per cent.

Use of ball bearings in agricultural machinery, HERMANNS (*Jahrb. Deut. Landw. Gesell., 28 (1913), No. 4, pp. 868–891, figs. 26*).—The author briefly reviews the history of the ball bearing as regards its origin, manufacture, and use in machinery, and points out its advantageous use in a series of more recent development of agricultural machinery.

Competitive tests of tractors and other apparatus for mechanical cultivation, G. D. DE CHASSART ET AL. (*Bul. Agr. Congo Belge, 4 (1913), No. 4, pp. 799–867, figs. 39*).—Tests of a number of steam and internal combustion tractors, motor plows, and motor cultivators are described in detail, and the results reported.

Out of a maximum of 310 points for construction, operation, and tractive power, the winning steam tractor received a rating of 283 points and out of a maximum of 305 points the winning internal combustion tractor received a rating of 266 points, followed closely by a second at 263 points. For construction and operation, the two leading motor plows were rated at 214 and 212.5 points respectively, and the leading motor cultivator at 193 points out of a maximum for all three of 245.

Mechanical cultivation with windlasses and cables, M. RINGELMANN (*Ann. Inst. Nat. Agron., 2. ser., 12 (1913), No. 2, pp. 299–343, figs. 12*).—The author describes the construction and operation of the roundabout system of windlass and cable plowing, reviews various tests of this system, and reports investigations on the power losses in windlasses, pulleys, and cables, and methods for computing them. By use of computations and test data based on these methods, he compares the roundabout system with the windlass and cable systems using one and two tractors.

The data show that when furnishing a tractive effort of 1,000 kg. the one-tractor, two-tractor, and roundabout systems, have respective mechanical effi-

ciencies of 78, 68.5, and 48.9 per cent, and on the basis that the motor should develop the average maximum power necessary multiplied by 1.75 (E. S. R., 29, p. 185), these systems will require respectively one 30 to 35 horsepower motor, two 35 to 40 horsepower motors, and one 50 horsepower motor.

Motor cultivation, its practical applications, T. BALLU (*La Motoculture, ses Applications Pratiques. Paris [1913], pp. 290, figs. 79; rev. in Ann. Sci. Agron., 4. ser., 3 (1914). No. 2, pp. 110, 111*).—The main purpose of this book is to present the principles underlying the construction in the more recent developments in mechanical cultivating machinery. Their cost and economic application are also treated as prime considerations.

On the history of horseshoeing, J. HORN (*Ueber den ältesten Hufschutz des Pferdes. Inaug. Diss., Univ. Leipsic, 1912, pp. 83*).—A treatise on the history and development of the art of horseshoeing since the earliest recorded history. A list of 84 references is appended.

Test of some joints used in heavy timber framing, H. D. DEWELL (*Engin. News, 71 (1914). Nos. 12, pp. 593–598, figs. 9; 13, pp. 666–669, figs. 5*).—Tests on pin-keyed, lag-screwed, and bolted timber joints and tests of washers are reported.

White oak, Australian hickory, and gas pipe pins were rejected as unsuitable material for pin-keyed joints. Extra heavy wrought steel pipe was practically as efficient as solid metal for pins, but the Hawaiian hard wood Ohia pins gave a higher resistance than either. In lag-screwed joints it is believed that the resistance of the screw is appreciably the same whether it bears against or across the grain of the main timber. "In the case of a metal plate lag-screwed to timber, . . . the strength would be determined by the strength of the screw in shear, or the plate in bearing."

Washer tests, by F. L. Bixby, showed the fallacy of using the ordinary washers with bolts or rods in which considerable tension exists. Other tests showed a great variation in the strength of different washers of the same size. The $\frac{3}{4}$-in. and $\frac{7}{8}$-in. washers were less efficient than those of larger diameter.

For permanent work it is recommended that washers be given an area to provide bearing across the fibers of Douglas fir at a stress of 285 lbs. per square inch when the stress in the bolt is 16,000 lbs. per square inch, and that no thickness of metal be less than one-quarter inch.

Anchoring houses in overflow districts, B. YOUNGBLOOD (*Texas Sta. Circ. 2, n. ser. (1914), pp. 8, figs. 2*).—Plans, specifications, and bills of material for two kinds of foundations or piers to be used in anchoring houses in the river bottoms, prepared by A. Mitchell, are given.

Beef cattle and sheep barns, R. S. CURTIS (*North Carolina Sta. Circ. 2, rev., (1914), pp. 21, figs. 13*).—This circular gives several ground plans, accompanied by descriptive information, of beef cattle and sheep barns, and is intended to cover the conditions existing on the various farms in the State where sheep and cattle are maintained.

In planning a cattle or sheep barn it is pointed out that provision should be made for the probable yearly increase in the number of animals, and that the barn should be so arranged that an extension may be conveniently made. The author advocates the construction of a two-story or loft barn as being better adapted to the needs of the general live-stock farmer. For beef fattening cattle he advocates the use of a barn large enough to house the cattle comfortably, thus saving the manure and avoiding the use of an excessive amount of bedding. "Each steer should be provided with at least 50 sq. ft. of space in a closed barn, which with a 10-ft. elevation, allows 500 cu. ft. of air space per animal. In an open barn this provision is not so important, yet it is

necessary to allow ample space for cattle to lie down and rest. . . . Two linear feet of trough space should be provided for each average-sized animal."

If more than a carload of cattle are to be fed it is considered advisable to have the feed passage in the center of the barn, while for carload lots or less, the feed passage may be placed at one side, and the entire number of cattle allowed to run together. In the management of breeding cattle the barns may be made with or without stalls.

The best type of implement shed for Texas farms, B. YOUNGBLOOD (*Texas Sta. Circ. 4, n. ser. (1914), pp. 8, figs. 3*).—This circular, based upon farm experience and observations on the care or neglect of implements on a great number of farms in the Southwest, gives plans and bills of material for implement sheds. "The intention is to embody in these plans some of the best ideas extant among the farmers of the State with those of a competent architect so that the sheds will not only prove satisfactory in point of construction, but will stand as long as the materials of which they are constructed may last." The special implement shed built to itself appears to be the most desirable type.

The Tennessee wooden-hoop silo, C. A. WILLSON (*Tennessee Sta. Bul. 105 (1914), pp. 109–119, figs. 5*).—The planning and construction of the wooden-hoop silo is illustrated and described. It is stated that this type of silo may be constructed at a cost of from $60 to $100, and will last from 8 to 12 years when well constructed of good material.

Silo facts, A. J. REED (*North Carolina Sta. Circ. 1 (1913), pp. 8, figs. 6*).—This circular briefly states important facts to be considered in the construction and filling of silos.

The disposal of creamery refuse, A. P. WILSON (*Dept. Agr. and Tech. Instr. Ireland Jour., 14 (1914), No. 2, pp. 241–251*).—Disposal of creamery refuse by irrigation or by septic tank treatment and filtration is discussed.

It is concluded that to discharge safely an effluent into a stream, it must not contain more than 3 parts per 100,000 of suspended matter, and at 65° F. must not take up more than 2 parts per 100,000 of dissolved oxygen in five days. "If the dilution, while not falling below 150 volumes, does not exceed 300, the dissolved oxygen absorption test may be omitted, and the standard for suspended solids fixed at 6 parts per 100,000. . . . If the dilution, while not falling below 300 volumes, does not exceed 500, the standard for suspended solids may be further relaxed to 15 parts per 100,000. . . . With a dilution of over 500 volumes all tests might be dispensed with, and crude sewage discharged."

Sewage disposal in the Tropics, E. WEISSENBORN (*Arch. Schiffs- u. Tropen-Hyg., 17 (1913), Beiheft 3, pp. 47, figs. 20*).—The author discusses methods of sanitation, particularly sewage disposal, such as are practiced in some tropical localities, both municipal and rural, and describes additional sanitary measures which he considers applicable.

Firing house heating boilers for testing, E. R. PIERCE (*Dom. Engin., 67 (1914), No. 1, pp. 2, 3, figs. 1*).—The author discusses the practical benefits of testing a residential heating system to determine its economic operation, referring particularly to the proper use of the chimney check.

RURAL ECONOMICS.

Agricultural surveys, G. F. WARREN (*New York Cornell Sta. Bul. 344 (1914), pp. 419–433*).—The author maintains that the primary object of agricultural surveys is to find out all the facts possible by studying actual conditions in the field. A survey should be limited to one problem only. He discusses the

use and development of statistical agricultural surveys, their accuracy, and methods of carrying on the work and of studying the data.

Value of records in agriculture, M. LAPLAUD (*Ann. Sci. Agron., 4. ser., 3 (1914), No. 4, pp. 171–185*).—The author discusses the value of records regarding the production of animals, crops, and labor, and concludes that there is no other method by which the maximum net results can be obtained.

Agricultural cooperation, B. H. HIBBARD (*Wisconsin Sta. Bul. 238 (1914), pp. 3–32, fig. 1*).—The author explains the purpose of cooperation, and the condition requisite to its success. The general principle of "one-man-one-vote" is advocated, also the federation of cooperative societies having similar purposes. The management of the organization should rest with a board of directors who should be authorized to employ a competent and trustworthy manager.

In Wisconsin the most common type of cooperation is the butter and cheese factory. The next most important is the farmers' telephone. The text of the Wisconsin law relating to cooperative associations is given, as well as articles of incorporation and a model constitution and by-laws for cooperative cheese producing associations, and a selected list of references on agricultural credit and cooperation.

A Dutch vegetable market (*Co-operation [London], 8 (1914), No. 5, pp. 95–99, figs. 3*).—This article contains a detailed description of the methods used in conducting auctions by the Loosduinen Cooperative Fruit and Vegetable Auction Market, Limited.

Concerning the servant question (*Wiener Landw. Ztg., 64 (1914), No. 11, pp. 93, 94*).—The author discusses the training of girls for house servants and the relative influence of serving in farm families as against the employment opened to them in cities in training them for future wives and mothers.

The occupying ownership of land, B. TOLLEMACHE (*London, 1913, pp. XIX+152*).—The author believes that occupying ownership is superior to occupying tenancy as a system to be adopted for small holdings. He describes several instances where large tracts have been subdivided successfully, and points out some elements that are essential to success in undertakings of this nature.

Statistics of agricultural population, wages of rural laborers, and the trend of immigration in different countries, A. CARONCINI (*Étude Méthodologique et Statistique sur les Recensements de la Population Agricole, les Salaires de la Main- d'œuvre Rurale, et les Courants D'émigration dans les Differents États. Rome: Internat. Inst. Agr., 1912, pp. XI+150*).—This report notes the publications in which data concerning agricultural population, farm wages, and immigration may be obtained, and discusses the variation in the classification and methods of reporting.

The colonization of rural Britain, J. COLLINGS (*London, 1914, vols. 1, pp. XXXII+290, pls. 16; 2, pp. 295–607, pl. 1*).—The author discusses the various measures that have been proposed to prevent the rural depopulation of England and the causes for the present conditions of agriculture and agricultural laborers, and makes suggestions for their relief.

Report of the Royal Commission on Agriculture, W. H. HAYWARD, A. LUCAS, S. SHANNON, W. DUNCAN, J. J. CAMPBELL, and J. KIDSTON (*Victoria, B. C.: Govt., 1914, pt. 1, pp. IX+42*).—The commission by means of hearings studied the various conditions affecting the agriculture of British Columbia. The principal part of their report describes conditions connected with the distribution of public lands and with the problems of agricultural labor, credit, and education. The report contains numerous recommendations.

The agriculture of the Cotswolds, R. ANDERSON (*Jour. Roy. Agr. Soc. England, 74 (1913), pp. 22–36*).—In this article are described the soil, climate, systems of cropping, methods of handling live stock, and general agricultural conditions.

Danish agriculture, R. SCHOU (*Mo. Bul. South. Com. Cong., 4 (1914), No. 3, pp. 2–5, figs. 3*).—The author calls attention to the fact that the number of cattle increased from 1,440,000 to 2,218,000 between 1881 and 1909, and the area devoted to root crops from 225,000 acres to 716,000 between 1888 and 1912, while the area devoted to other crops has remained practically the same.

Although cooperative agricultural societies are the means by which uniformity and high standard of quality in agricultural produce have been maintained, it is due to the close supervision and inspection of the State that they have been able to prevent fraud by those outside of the societies. The Government has exclusive control of the right of export.

Agricultural conditions in Norway, J. FROST (*Ber. Landw. Reichsamte Innern, No. 31 (1914), pp. VI+249, pl. 1, figs. 76*).—This volume contains a detailed description of the climate, soil, means of communication, and of agricultural conditions as they relate to the people, land tenure, system of farming, crops, live stock, markets, and agricultural credit. The work contains a number of statistical tables and illustrations setting forth the facts brought out in the text.

The general agricultural census of Belgium for 1910 (*Statis. Belg. Recense. Gén., 1910, Partie Doc., pp. 717*).—This volume contains data showing by Provinces, communes, and arrondissements the area devoted to different crops, average yields, total production, and amount of seed used per hectare.

[Agricultural element in the population of Austria], N. HOFMANN (*Statis. Monatschr. [Austria], n. ser., 18 (1913), Dec., pp. 983–985*).—In Austria, although the total number of males dependent upon agriculture increased from 6,440,405 in 1890 and 6,646,199 in 1900 to 6,667,787 in 1910, they form a decreasing percentage of the total population, viz, 55.1, 51.71, 47.51, respectively. The absolute and relative increase for the 20-year period is even greater among females, the numbers being 6,910,974, 7,063,005, and 7,168,297 and the percentages 56.62, 53.11, and 49.31, respectively.

[Agricultural statistics of the native States of India] (*Agr. Statis. India, 28 (1907–1912), II, pp. II+1–123*).—This annual statement contains statistical data showing for 1907–08 to 1911–12 the total land area classified according to agricultural uses, area irrigated, area in principal crops, and number of live stock for the native States of India, so far as information has been obtained.

[Agriculture in Japan] (*Statis. Rpt. Dept. Agr. and Com. Japan, 29 [1913], pp. 1–119*).—This annual report contains statistical data showing the number of households by form of tenure and by area of cultivated land, the area, production, and average yields of the principal farm crops, number of fruit trees and yield, silk production and trade, number of live stock and poultry, number of animals slaughtered, and number lost by diseases.

[Agriculture of Chosen] (*Statis. Rpt. Dept. Agr. and Com. Japan, 29 [1913], pp. 781–783*).—This report contains statistical data showing the agricultural population, the area of paddy fields and upland farms, area devoted to the principal crops, production of cocoons and raw silk, number of domestic animals and poultry, and number of animals slaughtered.

[Agriculture of Formosa] (*Statis. Rpt. Dept. Agr. and Com. Japan, 29 [1913], pp. 786–791*).—This annual report contains statistical data showing the agricultural population and area devoted to the principal food crops, number

of domestic animals, number of animals slaughtered, and the production of sugar, tea, and indigo.

The native agriculture of Tunis, P. DECKER-DAVID (*L'Agriculture Indigéne en Tunisie. Tunis and Auch: Govt., 1912, 2. ed., pp. IX+777, pls. 2, figs. 108*).—This is the general report of the commission for improving the native agriculture appointed May 13, 1911, and contains a detailed description of the soil, climate, peoples, systems of land proprietorship, irrigation, forestry, breeds and breeding of live stock, plants cultivated, industrial crops, and agricultural societies.

[Economic changes in the Union of South Africa], F. B. SMITH (*Union So. Africa Dept. Agr. Rpt., 1912–13, p. 29*).—The European population has increased from 1,116,806 in 1904 to 1,276,242 in 1911 and the number of European farmers from 77,926 to 97,381. Of the total land area (143,056,120 morgens or 485,050 square miles), 3,282,971 morgens were under cultivation, 892,929 lying fallow, 89,945,238 used for grazing, and 464,102 under irrigation. The number of cattle has been previously noted (E. S. R., 30, p. 494).

[Agriculture in the Commonwealth of Australia, 1903–1912], G. H. KNIBBS (*Commonwealth Bur. Census and Statis. Aust. Prod. Bul. 7 (1914), pp. 1–56, 132–149*).—This annual statement contains statistical data showing the land settlement; number of agricultural holdings, area, production, and value of agricultural products; imports and exports; and total number of live stock and number by size of holdings. The data relate principally to the crop year 1912–13, but for many items comparative data are given for a series of years.

AGRICULTURAL EDUCATION.

Report of committee on courses of dairy instruction, June 29, 1912, W. J. FRASER (*Proc. Off. Dairy Instrs. Assoc., 5–7 (1910–1912), pp. 105–112*).—This report considers the question of raising the present standards of instruction in dairying.

The committee thinks that "the ideal course should be so arranged as to distribute the dairy work throughout the four years and yet have time so that a man wishing to specialize in dairy work alone can get it all, or at least the major part, in one year. At least one-fourth of the students' work in the 4-year course should be devoted to technical dairying, as this is the least possible time in which the subject can be properly completed and sufficient training given."

The dairy work in the regular 4-year agricultural course should be arranged primarily to prepare dairy farmers, creamery operators, and city milk-supply men for their life work along practical lines. For college or experiment station work graduate courses should be utilized.

Attention is called to essentials to be considered in outlining the dairy work and to a number of debatable questions as to time to be devoted to various subjects. In the opinion of the committee it is best for students not to specialize too soon. Students insisting upon practical work to bring immediate results should be "specials," and 4-year men should have a good grounding in the fundamental sciences in the first two years in college, in connection with a little of the several different lines of technical agriculture, including dairying. All agricultural students should be required to study the elementary principles involved in the production and handling of milk. This should be from a 3 to a 5-hour course.

A discussion of the report follows.

Physiology in the veterinary curriculum as a factor toward higher veterinary training and education, A. F. SCHALK (*Vet. Alumni Quart. [Ohio State*

Univ.], 1 (1914), No. 3, pp. 81–85).—Calling attention to the need of establishing a higher plane of veterinary training and education by raising entrance requirements, lengthening the course, and strengthening the curriculum, the author takes up the subject of physiology as it is usually presented in the various veterinary curricula and attempts to show wherein it is often underestimated, neglected, or very feebly offered as a major integral in the course.

Nature study in the public schools, T. W. TURNER (*South. Workman, 42 (1913), No. 9, pp. 497–503*).—The author enumerates as the advantages of instruction in school gardening and nature study the bringing of the pupil and his parents into closer understanding, the aiding of the preservation of health, its considerable economic importance, in that it enables the pupil to aid the community in increasing its resources and in getting rid of noxious plants and animals, and its value as ethical training.

School gardens in America, V. E. KILPATRICK (*Amer. School Bd. Jour., 48 (1914), No. 5, pp. 12, 13, 79, figs. 7*).—The author discusses the history, support, forms, management, value, and location of some of the best organized school gardens.

The rural high school as a community center, E. W. GAGE (*Hoard's Dairyman, 47 (1914), No. 12, pp. 444, 450, figs. 3*).—Some of the common forms of community work in practice in agricultural high schools are enumerated, and as an illustration of this type of instruction a description is given of the organization, equipment, and work of the Agricultural High School of Baltimore County at Philopolis, Md.

Agricultural instruction (*Min. Agr. Argentina, Mem. Cong. Nac., 1912, pp. 29–36*).—An account is given of the organization of the practical and special or technical schools of agriculture and the agricultural extension service in Argentina, which are under the administration of the ministry of agriculture.

[Progress in instruction in agriculture and home economics for farm women in France], COUNTESS DE KERANFLECH-KERNEZNE (*Bul. Soc. Agr. France, 1914, Apr. 1, Sup., pp. 250–268*).—In this address at the convention of the Agricultural Society of France, February 17–21, 1914, the president of the women's section of the society reports on the progress made in agriculture and home economics instruction for farm women in France, including a brief review of the work of the section, an outline of the object and organization of the farm women's institute (cercle de fermières) and of the itinerant home economics school, and a description of two typical institutes and an itinerant agricultural home economics school. As a result of 18 months' work, 10 women's sections, 5 itinerant schools, and 25 institutes were established by private initiative under the impetus of the Agricultural Society of France and the Central Union.

The Agricultural Institute of the University of Göttingen (*Das landwirtschaftliche Institut an der Universität Göttingen. Neudamm, 1914, pp. [19], figs. 8*).—An account is given of the organization, equipment, and work of the institute.

An agricultural school in Austria (*Jour. Bd. Agr. [London], 20 (1914), No. 10, pp. 898–900*).—A description of the curriculum and notes on the organization and finances of the Francisco Josephinum Agricultural School at Mödling are given.

Courses of study in agriculture for the high schools of Illinois (*Agr. Col. Ext. Univ. Ill. [Circ.], 1914, Jan., pp. 62*).—This circular contains outlines of a course in agriculture for a well equipped 4-year high school and a 1-year agricultural course, as compiled and recommended by the agricultural section of the state high school conference. The general outline of the four agricultural units recommended covers (1) elementary principles of plant life and farm crops,

and (2) horticulture, one-half unit each in the freshman or sophomore year; (3) animal husbandry, one-half or a whole unit in the sophomore or junior year; (4) soils and crop production, one-half unit in the sophomore or junior year; (5) farm mechanics and (6) farm management, one-half unit each in the junior or senior year; (7) special farm problems, poultry raising, home dairying, etc., and (8) plant and animal improvement, one-half unit each in the senior year. An appendix outlines topics under country life interests to which one-half unit may be devoted in the senior year in connection with civics and United States history, suggestions for laboratory equipment, lists of good reference books for secondary agriculture, available Illinois Station bulletins and circulars and Farmers' Bulletins of this Department for school use.

One thousand questions in California agriculture answered, E. J. WICKSON (*San Francisco, 1914, pp. 257*).—These questions, which have actually been asked, and the answers thereto are classified under the subjects of fruit growing, vegetable growing, grain and forage crops, soils, irrigation, and fertilizers, live stock and dairying, feeding animals, diseases of animals, poultry keeping, and pests and diseases of plants.

[Agricultural instruction for the teachers of Porto Rico] (*Agr. Col. Weekly [P. R.], 1 (1913), Nos. 35, pp. 181–184; 36, pp. 185–188; 37, pp. 189–192; 38, pp. 193–217; 2 (1913), Nos. 47, pp. 245–248; 48, pp. 249–252; 49, pp. 253–256; 50, pp. 257–260; 51, pp. 261–264; 52, pp. 265–268; 53, pp. 269–272, figs. 3; 54, pp. 273–276; 55, pp. 277–280, fig. 1; 56, pp. 281–288; 57, pp. 289–292; 58, pp. 293–296; 59, pp. 297–300; 60, pp. 301–304; 2 (1914), Nos. 61, pp. 305–308; 62, pp. 309–314, figs. 2; 63, pp. 315–318; 64, pp. 319–322; 65, pp. 323–326; 66, pp. 327–334; 67, pp. 335–338; 68, pp. 339–344; 69, pp. 345–348; 70, pp. 349–352; 71, pp. 353–356*).—These articles deal with pineapple culture, irrigation and drainage, the practice and science of feeding farm animals, the instruction offered by the College of Agriculture of Porto Rico, home economics, agricultural instruction in the public schools, Easter week conference for teachers and the scholarship awarded by the agricultural college, physical training, the vegetable garden, the diet of the school child, the conservation of soil moisture, nitrogen, why trained agriculturists are needed in the Tropics, poultry growing in the Tropics, a thesis on foods, and school gardens.

Studies of trees, J. J. LEVISON (*Loose Leaf Field Manual, Wiley Tech. Ser., Exercises T 1–1—T 7–2 (1913), pp. 90, figs. 112*).—These exercises consist of studies of the identification, distribution, soil, location, enemies, planting, commercial values, etc., of various well-known trees, the insects injurious to trees and how to combat them, advice as to what trees to plant and how, pruning, tree diseases, tree repair, structure and requirements of trees, forestry, and care of the woodland.

Apple varieties, M. A. COBB (*Central State Normal School [Mich.], Bul. 19 (1912), No. 4, pp. 12, figs. 8*).—This agricultural bulletin for teachers is designed to arouse an interest in apple varieties and to explain how they are recognized or described. Rules are given for ordering varieties for an orchard.

Dairy laboratory manual and notebook, compiled by E. L. ANTHONY (*Philadelphia and London, 1914, pp. 72, figs. 15*).—This text-book is designed for use in general courses in elementary dairying. Instruction is given in the use of the Babcock tester, lactometer, farm separators, and churns.

Farm management, A. BOSS (*Chicago and New York [1914], pp. 237, figs. 72*).—"This text has been prepared for use in the secondary agricultural schools and in high schools giving courses in agriculture. It is intended to follow the more specialized subjects, such as farm crops, feeding and care of live stock, soils, and other similar courses. The best results will follow its use in the

junior or senior years. Only the large and more general problems in farm management have been discussed."

It is expected that the text, with the exercises, problems, and references to literature appended to each chapter, will make a full semester course.

Syllabus of home economics (*Baltimore, Md., 1913, rev., pp. 69*).—In reprinting this syllabus (E. S. R., 29, p. 496), advantage has been taken of the opportunity to make a few textual corrections and to revise and amplify the section on Aims and Results, the concluding subdivision of Household and Institution Management.

School gardens: General recommendations and suggestions for conducting school gardens, A. Hosking (*West of Scot. Agr. Col. Bul. 61 (1913), pp. 42–79, figs. 11*).—This bulletin contains the code of regulations re school gardens of the Scotch education department, regulations and suggestions proposed by the governors of the West of Scotland Agricultural College, schemes of work, pupils' notebooks, suggestions for autumn and winter work, data on the cost of establishing school gardens, suggested syllabuses of instruction in the elementary principles of horticulture and in the operations and practice of horticulture, a list of common trees and shrubs, and notes on meteorology.

Illinois Arbor and Bird Days, compiled by H. T. Swift ([*Dept. Pub. Instr. [Ill.] Circ. 77 (1914), pp. 71, figs. 52*).—This is a compilation of special articles including The Illinois Way of Foundation Planting, by W. Miller and F. A. Aust; What Our Parents Saw on the Prairies; Practical Points About Attracting Birds, by E. H. Forbush; The Jenny Wren Bungalow, by Rebecca H. Kauffman; economic notes on a number of birds, nature poems, and suggestions for the observation of Bird Day.

Arbor and Bird Day manual for West Virginia schools, M. J. Abbey (*W. Va. School Agr., 4 (1914), No. 3, pp. 58, figs. 28*).—Programs, directions for studying trees and birds, lessons on trees and birds, and general suggestions are given for the observation of Arbor and Bird Day.

Preparation of exhibits for fairs and contests, G. E. Thompson (*Kansas Sta. Circ. 36 (1914), pp. 7, figs. 8*).—Suggestions are offered for preparing exhibits of grain, corn, sorghums, grasses, and millets for fairs and contests.

MISCELLANEOUS.

Annual Report of Guam Station, 1913 (*Guam Sta. Rpt. 1913, pp. 24, pls. 4, figs. 6*).—This contains a summary of investigations by the special agent in charge, for the most part abstracted elsewhere in this issue.

Twenty-seventh Annual Report of Nebraska Station, 1913 (*Nebraska Sta. Rpt. 1913, pp. XXIV*).—This contains the organization list, a review of the work and publications of the year, and a financial statement as to the federal funds for the fiscal year ended June 30, 1913, and as to the remaining funds for the fiscal year ended July 31, 1913. The experimental work reported is for the most part abstracted elsewhere in this issue.

The county experiment farm; its function, selection, and management, C. E. Thorne (*Ohio Sta. Circ. 145 (1914), pp. 99–118*).—This contains an account of the work of the station, particularly with reference to its activities through county agents and county experiment farms, an explanation of the methods to be followed in securing a county experiment farm, and the text of the county experiment farm law as amended by the last general assembly.

NOTES.

Alabama College.—A recent number of *The Educational Exchange* announces that Prof. M. T. Fullan will furnish the county high schools, in which agriculture is a required subject of instruction, with a detailed course of study in manual training and farm mechanics in the form of mimeographed sheets pending its publication in book form. The boys' vocational work will consist of woodworking, farm mechanics, and mechanical drawing and the girls' work will include domestic science and art.

Arkansas University and Station.—Dr. R. R. Dinwiddie, pathologist and bacteriologist, who has been connected with the institution since 1887, has resigned with the intention of retiring from active service. Recent appointments include C. D. Stubbs, D. V. M., as assistant veterinarian in the manufacture of hog cholera serum, M. S. Baker, a 1914 graduate of the University, as assistant agronomist for research in the cotton investigation, Earl Kilpatrick as assistant agronomist, Miss Mary E. Metzger as assistant in home economics, and Miss Marcella Arthur for extension work in home economics.

Delaware College.—Dr. Samuel Chiles Mitchell, president of the Medical College of Virginia since 1913, has been appointed president.

Iowa College.—The registration at the summer school for teachers exceeded 600, an increase of over 160 per cent over the previous year. Agriculture and home economics were very largely selected by the teachers for study.

Maryland College.—A foreclosure sale was held September 22 of the half interest in 282 acres of the college property held by private stockholders of the joint stock company formed at the establishment of the college (E. S. R., 25, p. 403). The only bid was that of the state treasurer, thereby transferring title completely to the State of Maryland.

The first country life conference for rural ministers was held at the college in August with an attendance of over 200. It is expected to repeat the conference in 1915 and to hold a short course in agriculture for country ministers in connection with it.

Kansas Station.—Albert Hogan, Ph. D. (Yale, 1914) and E. L. Tague have been appointed assistant chemists. John C. Summers resigned in August as assistant chemist to accept a position with the *Cooperative Miller*.

Massachusetts College.—A department of rural engineering has been established with C. I. Gunness, formerly head of the department of mechanical engineering at the North Dakota College, as associate professor of rural engineering. A. Vincent Osmun has been promoted to the rank of associate professor of botany and F. A. McLaughlin to that of instructor. E. K. Eyerly, associate professor of rural sociology has resigned to become dean of the college of arts and sciences of the University of South Dakota and head of the department of economics and sociology.

Mississippi Station.—C. E. Wilson has succeeded R. N. Lobdell as assistant zoologist and assistant entomologist.

Montana College and Station.—H. E. Murdock of the Irrigation Investigations of this Office has been appointed in charge of the station work just instituted in agricultural engineering, beginning September 1. R. F. Miller, assistant in

animal husbandry in the station, has resigned to take effect October 1 to accept a position with the Texas College and has been succeeded by Russell R. Dodderidge, a graduate of the Kansas College. L. G. Schermerhorn, assistant professor of horticulture and assistant horticulturist, has resigned to accept a position with the New Jersey Stations, to take effect November 1.

Nebraska University and Station.—On September 1, Dean Burnett was appointed head of the department of animal husbandry and C. B. Lee and H. J. Gramlich professors of animal husbandry and associates in the station.

Nevada University and Station.—Archer Wilmot Hendrick, dean of Whitman College, Washington, has been appointed president. Frederick W. Wilson, animal husbandman of the Arizona University and Station, has been appointed in charge of the department of animal husbandry and has entered upon his duties. Other appointments include Dr. Philip A. Lehenbauer as professor of botany and horticulture, Jerome B. Frisbie, instructor in farm mechanics at the Colorado College, as assistant in agronomy, and Miss Norma J. Davis as state leader in home economics in the division of agricultural extension.

New Mexico College and Station.—Despite the loss of many Mexican students and a considerable number of preparatory students through the establishment of additional high schools, the total attendance at the college shows a gain of 15 per cent. Three-day extension courses in agriculture have been offered at many points in southern New Mexico with an aggregate attendance of 1,400.

Among the recent appointments are the following: A. C. Cooley, of Colorado, as director of extension work and farm management; J. M. Mann, instructor in botany at the University of Wyoming, as assistant professor of biology; Miss Lucy T. Boyd, as instructor in household economics; and Robert Latta and James R. Meeks, both graduates of Purdue University, as assistants respectively in dairying and animal husbandry.

Cornell University.—In order to familiarize farmers with the provisions of a new state law on grading and packing apples, demonstrations have been given by the college of agriculture in special cars operated in the fruit growing districts by the New York Central Lines. This special train is the seventh of the present year.

The department of floriculture has recently received two valuable collections of orchids from the Philippine Islands, one being presented by H. Boyle and the other by Dr. A. R. Ward.

North Dakota Station.—W. H. Peters, professor of animal husbandry at the Manitoba Agricultural College, has accepted a position as animal husbandman. He has been succeeded in Manitoba by G. Ward Jones, superintendent of the college extension work.

Pennsylvania Institute of Animal Nutrition.—F. C. Dosé (Pennsylvania State, 1914) has been appointed assistant in animal nutrition vice D. H. Kauffman, resigned, and entered upon his duties September 1.

South Carolina Station.—C. A. McLendon, formerly botanist and plant pathologist of the Georgia Station, has accepted a position as field pathologist, vice L. O. Watson, who has been placed in charge of the cotton wilt studies of the Bureau of Plant Industry of this Department.

Texas College.—C. M. Evans has resigned as superintendent of extension work beginning September 1 to become editor of the *Southern Farm and Dairy Magazine*, published at Bryan, Tex. He has been succeeded by Clarence Ousley as director of the extension service.

Vermont University.—*The New England Homestead* announces that the trustees have allotted $3,600 per annum to the support of county farm agents beginning July 1. They also have authorized the erection of a stock judging

pavilion 100 by 120 feet, the provision of space for instruction in farm machinery, and a revision of the courses of instruction.

Virginia College and Station.—Lyman Carrier, agronomist since 1907, has accepted a position with the Office of Forage Crop Investigations of this Department, and has been succeeded by T. B. Hutcheson, associate professor in plant breeding in the University of Minnesota and associate in the station. W. K. Brainerd, professor of dairying and dairy husbandman, has accepted a position with the Dairy Division of this Department.

Virginia Truck Station.—The station office building has been doubled in size and a new building for farm implements and storage and a new insectary have been erected.

Washington College and Station.—M. A. McCall has been appointed vice director of the dry-land department vice H. E. Goldsworthy, resigned, and with headquarters at Lind. T. J. Newbill of Portland, Oreg., has been appointed state leader of boys' and girls' club work, and R. N. Miller, farm efficiency agent. In the station A. L. Sherman has been appointed assistant chemist and F. W. Allen assistant horticulturist vice W. J. Young, resigned.

New York Commission on Bovine Tuberculosis.—A commission to study the causes of bovine tuberculosis and its economic and health effects on the State has been authorized by the New York legislature. This commission has been appointed by Governor Glynn as follows: Dr. Theobald Smith, director of the division of animal pathology of the Rockefeller Institute; Dr. Hermann M. Biggs, commissioner of health; Dr. Linsly M. Williams, deputy commissioner of health; Dr. Philip Van Ingen of the New York Milk Commission; Dr. Henry L. K. Shaw, professor of children's diseases, Albany Medical College; Hon. Seth Low, of New York City; and Dean V. A. Moore of the New York State Veterinary College of Cornell University.

Agriculture at the National Education Association.—The program of the National Education Association at St. Paul, Minn., July 4–11, indicates the unusual recognition given to agricultural education at this meeting.

As in former years, the question of the training of teachers for the rural schools brought out much discussion. In a paper before the Department of Rural and Agricultural Education, on The Course in Agriculture for Training Teachers in Normal Training High Schools, A. V. Storm maintained that the rural school is the most important educational factor and the preparation of the rural school-teacher the most important educational task. Inasmuch as the normal schools will not be able to supply the demand for rural teachers for years to come the public high schools must shoulder the burden. A large majority of rural teachers are women, many of whom are reared in town, so they must be taught agriculture from the farmers' point of view and must study rural conditions as well as agricultural text-books. He outlined the work that ought to be done as including (1) a knowledge of some of the underlying principles of education and consequently of teaching, (2) the organization of agricultural subject-matter to be taught in accordance with these principles, which includes the amount, selection, sequence, arrangement, and units to fit the conditions of a rural elementary school, (3) some understanding of the principles, processes, and practices to be followed in the presentation of this subject-matter through the classroom, the home project, and the community work, and (4) actual practice in teaching the subject-matter in this manner.

In another address before the same department on The Rural High School, U. S. Commissioner of Education Claxton emphasized the importance of ascertaining the kind of education that the American farmer needs before attempting to outline a course in agriculture for rural high schools. His address dwelt mainly with the education and training of the farmer and his wife.

The organization of boys' and girls' clubs, as well as adult clubs and similar forms of rural endeavor, was considered this year for the first time. One afternoon devoted to this phase included papers on such topics as What Recognition Should Be Given Vacation and Other School Project Work Done by Pupils, and The Federated Boys' and Girls' Club Work of the United States, and five-minute reports of state and district club-work leaders on projects conducted, membership, club leaders, method of financing, apparent results, recognition given the work in the schools, and prospective club work.

At a meeting of the state and national club leaders, an address was given by E. J. Tobin, county superintendent of schools of Cook County, Ill., on Club Work as an Extension Service of the Public Schools. Mr. Tobin regarded club work, properly conducted, as the best means of tying up the home life of the pupil with the school, as well as of teaching certain subjects. A necessary preliminary to the successful organization of club work, however, is the provision of competent supervisors to follow up the matter during vacation. In Cook County, five country life leaders, one for 25 or 30 schools, are employed the entire year to initiate, carry on, and supervise rural community betterment work. One of their main endeavors is to organize every boy and girl over ten years of age residing in their division into an agricultural club. During the winter months they assist the teachers in giving agricultural instruction in the schools, and during the summer vacation they become itinerant teachers, corresponding to the "Wanderlehrers" in Germany, traveling from one farm to another to visit, inspect, and advise with the boys and girls.

In addition to an afternoon devoted to a conference on School Gardens in Cities, papers were read before the School Garden Association of America on Home Gardens in Indiana, School Gardening on the Prairie, and School Gardening in Los Angeles. Commissioner Claxton also addressed the latter association on Purposeful Occupations for Boys. He maintained that it is impossible to really educate any child who early in life does not engage in some purposeful occupation, that there should be a teacher of gardening in every city school, and that such work would yield considerable financial returns to families and improve the physical, intellectual, and moral condition of the children.

Agricultural Progress in Latin America.—The government of Cundinamarca, Colombia, has contracted with H. Charton, proprietor of vineyards of the municipality of Tocaima, to establish an agricultural institute on his property. The school will begin operations with twelve pupils selected from the municipality. Marcel Berthaul of Paris has been appointed professor of agronomy in the University of Narino. The Colombian Government has also authorized the employment of four instructors of tropical agriculture and two veterinarians.

The Elidoro Villazon National Agronomic and Veterinary Institute at Cochabamba, Bolivia, is now well equipped with experimental grounds, laboratories, library, machinery, and apparatus, and furnishes a 4-year course of theoretical and practical instruction in agronomy and veterinary science. The scholastic year begins in March. A number of scholarships are available to needy students. Pedro Charuli is acting director of the school and a number of the professors are specialists from abroad.

Dr. Moises S. Bertoni, an experienced agronomist and botanist and director of the agricultural station at Asuncion, Paraguay, has been appointed chief of the Bureau of Agriculture of the government of Paraguay. An agricultural school is being established at Ypacarai, with two instructors who have been educated abroad in charge of the several courses.

A three-year theoretical and practical course in agriculture is now being offered in the Peruvian National College of San Luis Gonzaga at Ica. A viticultural experiment station has been in operation in the Moquegua Valley,

under the direction of Julio Solano. A new school is also to be established at Puno, the Peruvian port on Lake Titicaca, for native boys from 6 to 14 years of age. The instruction will be elementary and practical with the aim of developing mining, agriculture, and other industries in this section.

In Uruguay the Paysandu agronomic station, established nearly two years ago, is under the direction of Felix Ruppert and includes 1,360 hectares of land, of which 605 are in flax, wheat, oats, potatoes, and maize. A beginning has been made in the cultivation of olives, oranges, peaches, apples, and pears, and a small forest has been started. The station has a dairy and creamery in operation and is well equipped for raising chickens and other domestic fowls. It also possesses 170 milch cows and 700 ewes, and the breeding of horses and sheep is taught. Both theoretical and practical instruction is given.

The Province of Salta in Argentina has given the subtropical agricultural experiment station at Güemes in the department of Campo Santo 200 hectares of land for experimental work in the cultivation of citrus fruits. The growing of cotton, tobacco, and tropical fruits is being successfully carried on at the station. The eight practical agricultural schools of Argentina had 239 pupils in 1912 and 305 in 1913.

Roseworthy Agricultural College, South Australia.—Principal A. J. Perkins has been appointed to succeed William Lowrie, resigned, as director of agriculture in South Australia. He will be chief technical adviser to the minister of agriculture and will also be responsible for the general experimental work and management of the government farms throughout the State. W. J. Colebatch, superintendent of agriculture in the Southeast and manager of the Kybybolite Experiment Farm, has been appointed principal of Roseworthy College. W. J. Spafford, the lecturer and demonstrator of agriculture and assistant experimentalist at Roseworthy College, has been appointed to the new position of superintendent of agricultural and experimental work and will, under the instructions of the director, supervise the experimental work conducted by the department outside the experiment farms.

Western Australian Farm School.—The Child Emigration Society of England has established a farm school at Pinjarra as an experiment in child emigration. There are 33 boys from England, Scotland, and Wales at the farm, from 7 to 12 years of age. Until 14 years of age the boys are subject to the elementary education of the State, after which they receive two or three years of definite agricultural instruction before they are given positions with reputable farmers. Each boy is given a garden plat and is also taught the elements of pruning fruit trees, packing apples, caring for pigs and poultry, and milking cows. All are employed in turn in house duties. The quarterly cost of supervision, clothing, and maintenance of one boy has been $126 a year which it is hoped to reduce to $97.

Miscellaneous.—Ph. van Tieghem, the well-known French botanist and permanent secretary of the Academy of Sciences, Paris, died April 28, 1914, in his seventy-fifth year.

Dr. Jacob Eriksson has resigned the position of chief of the phytopathological experiment station at Stockholm, Sweden.

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VOL. XXXI. ABSTRACT NUMBER. No. 6.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Standardization of potassium permanganate solution by sodium oxalate, R. S. McBRIDE (*U. S. Dept. Com. and Labor, Bur. Standards Bul., 8 (1913), No. 4, pp. 611–642*).—In view of the numerous methods proposed for the standardization of potassium permanganate solution, the Bureau of Standards has sought a substance which would furnish reasonably correct results. "It was desired, if possible, that the standard selected should serve a threefold purpose, viz, first, as a primary standard of oxidimetry; second, as a working standard for regular use in [our] own laboratories; and third, as a substance which could be distributed by the Bureau with a guaranty both as to its purity and as to its reducing value when used under specified conditions."

Sodium oxalate seemed best to fill the needs, and the results of the investigation showed that the main source of error in the oxidimetric titration is the loss of oxygen. "For this purpose the following detailed method of operation is recommended: In a 400 cc. beaker dissolve 0.25 to 0.3 gm. of sodium oxalate in 200 to 250 cc. of hot water (80 to 90° C.) and add 10 cc. of (1:1) sulphuric acid. Titrate at once with tenth-normal $KMnO_4$ solution, stirring the liquid vigorously and continuously. The permanganate must not be added more rapidly than 10 to 15 cc. per minute, and the last ½ to 1 cc. must be added dropwise with particular care to allow each drop to be fully decolorized before the next is introduced. The excess of permanganate used to cause an end-point color must be estimated by matching the color in another beaker containing the same bulk of acid and hot water. The solution should not be below 60° by the time the end point is reached; more rapid cooling may be prevented by allowing the beaker to stand on a small asbestos-covered hot plate during the titration. The use of a small thermometer as a stirring rod is most convenient in these titrations, as the variation of temperature is then easily observed."

Benzoic acid as an acidimetric standard, G. W. MOREY (*U. S. Dept. Com. and Labor, Bur. Standards Bul., 8 (1913), No. 4, pp. 643–650*).—Benzoic acid is considered a satisfactory reagent for standardizing acidimetric solutions. See also a previous note by Phelps and Weed (E. S. R., 21, p. 610).

A new apparatus for quantitative dialysis, A. GOLODETZ (*Chem. Ztg., 37 (1913), No. 26, pp. 259, 260, fig. 1*).—The construction of the apparatus, which is illustrated, is similar to that of the Soxhlet extractor.

The use of spectrophotometry in analysis, C. Féry and E. Tassilly (*Ann. Falsif., 6 (1913), No. 52, pp. 73–78*).—The use of an apparatus combining the principles of the colorimeter and spectroscope for measuring the amount of substance yielding a color is recommended in place of the usual colorimeter, which involves many errors. The estimation of iron in water and copper in foods is considered in this regard.

Estimation of alkalis in rocks, H. V. Krishnayya (*Chem. News, 107 (1913), No. 2779, pp. 100, 101; abs. in Jour. Chem. Soc. [London], 104 (1913), No. 606, II, p. 339*).—The method consists in heating a suitable quantity of the powdered rock in a platinum dish with hydrofluoric and sulphuric acids, and after removing the excess of acid, dissolving the residue in boiling dilute hydrochloric acid. If any material remains, the treatment with sulphuric and hydrofluoric acids is repeated. The filtrate obtained is made up to a definite volume "and an aliquot part, representing 1 gm. of the sample, is withdrawn. After evaporating to dryness and igniting the residue, thus rendering the iron and alumina insoluble, the alkali sulphates are extracted with boiling water, and without filtering converted into chlorids by adding barium chlorid solution; some barium hydroxid is also added. After removing the excess of barium with ammonium carbonate, the alkali chlorids are weighed jointly as usual. The potassium is then estimated as platinichlorid in the ordinary manner."

Examination and judgment of water for agricultural and industrial purposes (*Ztschr. Landw. Versuchsw. Österr., 15 (1912), No. 11, pp. 1221–1231*).—This deals primarily with the criterions for judging water for agricultural purposes, i. e., drinking water for animals, baking, and other domestic purposes, in the dairy, and for watering plants, but also includes the judgment of water for starch manufacture, sugar refining, malting, brewing, alcohol and yeast production, tanning, glue and gelatin manufacture, and silk spinning, and a short chapter on the chemical and biological analysis of water. The methods set forth were adopted by the officials of the Association of Austrian Agricultural Experiment Stations.

Examination and judgment of waste waters (*Ztschr. Landw. Versuchsw. Österr., 15 (1912), No. 11, pp. 1232–1237*).—These are the methods adopted by the Association of Austrian Agricultural Experiment Stations in regard to the examination of sewage water, especially from the standpoint of stream pollution, etc.

The use of potassium palmitate in water analysis, C. Blacher, P. Grünberg, and M. Kissa (*Chem. Ztg., 37 (1913), No. 6, pp. 56–58*).—Potassium palmitate is preferred to potassium stearate for use in Clark's and similar methods for determining the hardness of water. The presence of humates in boiler water does not interfere with the results obtained by the palmitate method, but when soap is used the results are unreliable. In the analysis of waters containing humates the indicator methyl orange can not be employed. When comparing phenolphthalein with anthranilic acidazodimethylanilin it was found that the neutral points were very near one another, and it is proposed to use the latter compound as an indicator in place of methyl orange for the determination of the temporary hardness which has been termed the methyl orange alkalinity. It can also be employed in connection with determining the permanent hardness of water.

Potassium palmitate solution may also be employed for determining the sulphates in water. For estimating the magnesium in water a modification of the Pfeifer method is employed which is described.

Estimation of total nitrogen, E. R. Noyes (*U. S. Naval Med. Bul., 7 (1913), No. 3, pp. 394, 395*).—The method, while primarily intended for the analysis of urine, is considered of value for other purposes. It is carried out as follows:

"In a test tube (15 by 150 mm.) place 1 cc. of urine and 1 cc. of strong sulphuric acid and boil until frothing ceases, being careful not to allow any of the froth to leave the tube. Cool and add 0.5 gm. potassium sulphate and again boil until solution becomes nearly or quite colorless. Cool and then make up contents of tube to 5 cc. with water. Again allow to cool and then fill the small arm of the Hinds-Doremus ureometer with it, the large arm of the instrument being filled with sodium hypobromite solution. The usual manipulations for a urea estimation are now carried out, allowing, however, 2 cc. of the acid solution to run into the hypobromite. The number of divisions occupied by the evolved gas is observed and then multiplied by 0.373, the result being the number of cubic centimeters of nitrogen. Correct this volume for temperature and pressure and multiply the result by 0.00125, the final result being the weight in grams of total nitrogen in 0.4 cc. of urine."

The time required for the operation should not exceed 30 minutes.

A new volumetric estimation of nitrites and separation of nitrous and nitric acids, W. M. FISCHER and N. STEINBACH (*Ztschr. Anorgan. Chem., 78 (1912), No. 1, pp. 134–140; abs. in Jour. Chem. Soc. [London], 102 (1912), No. 601, II, pp. 1093, 1094*).—"There is no satisfactory method for the estimation of nitric acid in the presence of nitrous acid. A method is provided by the rapid esterification of nitrous acid in which oxidation to nitric acid does not take place, as is proved by experiments with pure silver nitrite. The solution is placed in a 300 cc. flask, 5 cc. of methyl alcohol is added, and a mixture of tenth-normal hydrochloric acid with a little methyl alcohol is allowed to flow in, while a current of air is drawn through the liquid. After 20 cc. of acid have been run in, the stream of air is continued for five minutes, and the solution is then titrated with sodium hydroxid solution, free from carbonate and phenolphthalein. The reaction is: $NaNO_2+HCl+CH_3.OH=NaCl+CH_3.O.NO+H_2O$.

"In the separation of nitric and nitrous acids, a mixture of sulphuric acid and methyl alcohol is placed in the flask, and the solution to be tested, mixed with methyl alcohol, is added drop by drop, air being passed through. The contents of the flask are then washed into a Jena flask, 2.5 to 3 gm. of Devarda's alloy are added, together with 20 gm. of potassium hydroxid, and the ammonia formed is distilled into fourth-normal hydrochloric acid and titrated."

Controls for the Folin method of estimating creatinin, W. H. THOMPSON (*Jour. Physiol., 46 (1913), No. 2, pp. I, II*).—The control against which the Folin standard solution, i. e., seminormal potassium bichromate solution, is usually tested is a solution of creatinin prepared from creatin by boiling with normal hydrochloric acid for 3 to 4 hours, it being assumed that the transformation is quantitative and completed in this time. The present investigation tends to disprove that this is the case, as the transformation was found to be variable.

In seeking other methods for preparing creatinin from creatin, the Folin autoclave method was tried, but without satisfactory results. A picrate of creatinin was then prepared by the autoclave method and of this substance 0.0757 gm., which corresponded to 0.025 gm. of creatinin, was dissolved in water and made up to 50 cc. Ten cc. portions were then taken and each of them treated with 14 cc. of a 1.2 per cent picric acid solution and 5 cc. of a 10 per cent sodium hydroxid solution, and after standing for 7 minutes the contents of each tube was diluted with water to 250 cc. Readings were then made against an 8 mm. column of a seminormal solution of potassium bichromate. The readings, which were in the neighborhood of eight, were very satisfactory and corresponded to the Folin value.

The double picrate of creatinin and potassium was also prepared from urine in the manner described. The readings obtained with this material were likewise satisfactory. Both salts were found to be very sensitive to the amount of alkali used in the method.

The reaction between metallic salts and the soluble carbonates, and its bearing upon the precipitation of protein, W. N. HEARD (*Jour. Physiol., 46 (1913), No. 2, pp. 104–128, figs. 3*).—"Since thorough dialysis removes all precipitation of emulsoid protein by salts of the heavy metals, except in concentrated solutions of the latter, precipitation must be intimately associated with some removable constituent. The experiment of adding salts to such dialyzed solutions shows that the production of a body with a very low solubility product is the necessary condition in causing precipitation. The only salt found in the dialyzate which is capable of producing this result is a bicarbonate (except in the case of silver). The reaction of the metals with emulsoid protein closely follows the reaction of these metals with soluble bicarbonates, and it is therefore concluded that the process depends upon this reaction.

"If it be considered to be proved that the presence of soluble bicarbonates is the determining factor in the precipitation of emulsoid protein, it establishes a probability that the precipitation of suspensoid protein is due to a reaction between the metals and soluble carbonates. The reaction between the metals and suspensoid protein follows in degree and also in the shape of the curves produced, the reaction between these metals and soluble carbonates, the general increase of precipitability accompanying the suspensoid state coupled with the partial conversion at any rate of the bicarbonate into carbonate being suggested as the cause of the difference of behavior of the two kinds of protein with the salts of the metals. No dialysis can remove all the salts present and it can easily be shown that a protein solution after sufficient dialysis to make it non-precipitable, as above stated, is distinctly alkaline to alizarin and when converted into the suspensoid state requires a certain definite quantity of acid to neutralize it, the amount being about one-quarter of that which would be needed with it undialyzed.

"Probably the precipitation of bicarbonates and carbonates acts mainly by the removal of the OH ions freed by the hydrolysis of these salts. But the results with $AgNO_3$ and NaCl suggest that there are other factors."

Quantitative determination of peptic activity, S. VON BOGDÁNDY (*Hoppe-Seyler's Ztschr. Physiol. Chem., 84 (1913), No. 1, pp. 18–28; abs. in Chem. Abs., 7 (1913), No. 13, p. 2235*).—From the Schütz (polarization) and Volhard methods for determining peptic activity a method was evolved which combines some of the salient features of the two. The casein used in the experiments contained 7.3 per cent of water, and the dried material 1.08 per cent of ash and 15.34 per cent of nitrogen.

The solutions required in the test were as follows: A 3.3 per cent solution of casein is prepared by stirring up 17.5 gm. of casein with 250 to 300 cc. of distilled water and then adding 27.5 cc. of normal hydrochloric acid solution; the solution is then poured into a 500 cc. flask and filled up to the mark with water. The solution of the casein is accomplished in the water bath at 40° C. and requires from ½ to 1 hour. As a precipitating reagent for the casein a solution composed of 150 gm. of sodium sulphate, 50 gm. of magnesium sulphate, 100 cc. of alcohol (96 per cent), and water to make 1 liter is employed. If crystals are deposited in the solution they can easily be dissolved by heating the solution to a temperature of from 35 to 40°.

The actual procedure is as follows: In a 100 cc. graduated flask place 60 cc. of the casein solution and the necessary amount of Grübler's pepsin in 0.2 per cent hydrochloric acid, and then place the flask in a water bath kept at 40°.

After the lapse of the proper time add 30 cc. of the precipitating reagent and water to make 100 cc., shake well, and filter through a plated filter. The filtrate is then polarized in a 200 mm. tube with a Schmidt and Haensch triple field polariscope.

A new adulteration of olive oil, A. CUTOLO (*Bol. Soc. Nat. Napoli, 2. ser., 24 (1910), pp. 117–120*).—Olive oil was adulterated with a mineral oil and colored with methyl azodimethylanilin.

Determination of total tartaric acid in wine. P. MALVEZIN (*Ann. Chim. Analyt., 18 (1913), No. 1, pp. 19–21; abs. in Rev. Gén. Chim., 16 (1913), No. 15, Répert., p. 269*).—Carefully distill 22 cc. of wine until only 2 cc. are left in the flask, and after cooling add 1 cc. of a 10 per cent potassium bromid solution and 40 cc. of an ether-alcohol mixture (equal volumes); then refrigerate for from 15 to 20 minutes and proceed with the precipitate in the usual manner prescribed for the determination of tartaric acid.

The determination of alcohol in wine, G. TOMMASI (*Ann. R. Staz. Chim. Agr. Sper. Roma, 2. ser., 6 (1913), No. 2, pp. 125–156*).—The method used in Italy and the one employed at the port of New York for determining the alcohol content of wine (distilling off the alcohol and determining the percentage of alcohol in the distillate by estimating its specific gravity with either a hydrostatic balance or picnometer) lead to the same results. The differences usually noted, however, are probably due to the different specific gravity tables from which the percentage of alcohol is read off. In the article a correction table is given for estimating the alcohol content found by Windisch's table and that which would be found if the table in the U. S. Internal Revenue Gangers' Manual were used.

Tables for determining the amount of alcohol from the specific gravity, I, G. TOMMASI (*Ann. R. Staz. Chim. Agr. Sper. Roma, 2. ser., 6 (1913), No. 2, pp. 157–194*).—A table is given with which it is possible to calculate the alcohol content of an alcohol-water mixture to percentage by volume or weight at 15° C. when the temperature at which the specific gravity is taken lies between 10 and 25°.

Contribution to our knowledge of the composition of milk and its serum, W. BREMER, W. GREIFENHAGEN, and K. SAUERWEIN (*Ztschr. Untersuch. Nahr. u. Genussmtl., 24 (1912), No. 8, pp. 507–512; abs. in Chem. Ztg., 37 (1913), No. 14, Repert., p. 59*).—The difference between the highest and lowest amounts of total solids noted in 16 milk sera was much lower than that in the milk from which the sera were prepared. Consequently, the serum can be used for determining the quality of the milk.

The variations in the amount of total ash, calcium, and phosphoric acid in milk and serum were very irregular. The sera of five samples of milk and the skim milk obtained from the whole milk, however, showed a fairly close agreement.

The influence of boiling on the physical-chemical behavior of woman's milk, cow's milk, and buttermilk, P. GROSSER (*Biochem. Ztschr., 48 (1913), No. 6, pp. 427–431*).—The question as to whether the constituents of various milks are alike from a physical-chemical standpoint has been investigated by Köppe and others, and the conclusion has been drawn that the salts—at least the salts of calcium—are ionized in human milk, while in cow's milk the ions are not present in a free state. It has furthermore been shown that the favorable action of buttermilk in infant feeding is due to its physical-chemical resemblance to human milk.

In this investigation the above problem was studied with Bechhold's ultrafiltration method whereby one can eliminate many of the errors present in the

lesser refined methods which have been used in the older investigations. With the Bechhold method it is not necessary to dilute the milk and consequently any change in the conditions of dissociation which might occur as a result of adding water are prevented. It also allows working with compressed nitrogen for the purpose of preventing decomposition, and, furthermore, a concentrated filtrate is obtained.

It was found that boiling produces no depression of the freezing point in either cow's or human milk. The nitrogen and phosphoric acid content were practically not affected in cow's milk, but in human milk an appreciable reduction in nitrogen and phosphoric acid was produced. The calcium content in the ultrafiltrate of both milks is diminished by long boiling, especially in cow's milk. No changes were noted when buttermilk was boiled.

From the data obtained with unboiled milk it can be seen that in human milk the amount of noncolloidal rest nitrogen (nitrogen not precipitated by phosphotungstic acid) is greater than in cow's milk, and, furthermore, that a larger percentage of phosphoric acid and calcium is present in the free state in human milk than in cow's milk. Buttermilk, so far as calcium and phosphoric acid are concerned, has a greater resemblance to human milk than to cow's milk. The acid fermentation which has taken place in buttermilk results in a scission of phosphoric acid from calcium.

The biologic differentiation of milk proteins, H. KLEINSCHMIDT (*Monatsschr. Kinderheilk., 10 (1911), pp. 402–419; abs. in Ztschr. Immunitätsf. u. Expt. Ther., II, Ref., 6 (1913), No. 15, p. 1100*).—Corresponding to the results obtained with the complement fixation and precipitation reactions, it was also found possible to differentiate milk proteins with the anaphylactic test and guinea pigs; thus serum and milk proteins could be differentiated. The albumin and globulin of whey seem to be the same substance. Casein is markedly differentiated by the reaction.

Animals sensitized with cows' milk albumin were not affected by injections of casein. By a second injection of the homologous antigen, antianaphylactic phenomena were observed. Animals sensitized to globulin became sick on receiving the amount of casein which is lethal to animals sensitized with casein.

Biological method for judging the quality of milk, S. PARASCHTSCHUK (*Milchw. Zentbl., 42 (1913), No. 3, pp. 65–69, figs. 9*).—In investigations on the biological properties and peculiarities of various strains of lactic acid bacteria it was observed that not every strain gave a good coagulum with milk, and that the souring of milk at times went on very slowly. It often occurred that cultures of equal strength and kind kept under the same conditions would not coagulate certain kinds of milk at all. It was later found that certain strains would not develop in poor milk, and consequently the use of lactic acid bacteria for judging the quality of milk suggested itself.

The milk under examination was poured into a flask and sterilized, and then inoculated with the appropriate strains (1 to 2 per cent) of lactic acid bacteria and incubated at 32 to 36°. Good milk after the lapse of from 5 to 6 hours is coagulated. If the inoculation has been made with a loopful of bacteria, the time required for coagulation is about 12 hours.

For inoculation five separate strains of bacteria were used, as follows: (1) A Danish streptococcus previously used for preparing dry lactic acid cultures and which only grows on fresh milk; (2) a small diplococcus obtained from Jaroslaw, which gives a marked coagulation and is characterized by the fact that it remains virulent for eight months, or twice as long as any other culture; (3) Günther's lactic acid diplococcus, which yields a pleasant sweetish coagulum of not an especially thick consistency (the last two-named strains of organisms require a milk of good quality for development, although they will

develop in milk in which the Danish streptococcus will not grow or die); (4) a Russian lactic acid streptococcus which yields a thick, ropy coagulum and will grow in milk of not especially good quality (the chief microscopical difference between this organism and the Danish strain is the fact that the former has a characteristic size and appears in elongated pairs); and (5) the *Bacillus bulgaricus* (Metchnikoff) which is characterized by developing under abnormal conditions and will grow in milk of poor quality. An addition of a large amount of bicarbonate of sodium will not hinder the development of this organism, and it forms a tenacious coagulum.

If the milk under examination is of very good quality it will, after coagulation, show the following microscopic picture: Numerous Danish streptococci appearing as elongated diplococci and many small lactic acid bacteria (Günther and Jaroslaw diplococci), a few Russian streptococci, and a few *B. bulgaricus*.

Milk of medium quality requires about two hours longer for coagulation than milk of good quality, and in curdled milk the Danish streptococci are practically absent and are displaced by many small cocci, the Russian streptococcus, and the *B. bulgaricus*. In the poor milk the small lactic acid bacteria die, the Russian streptococci develop slowly and die, and only the *B. bulgaricus* survives.

A fresh milk or a milk which has been cooled down to and stored between 6 to 8° C. after drawing are the only ones which will yield satisfactory results with the test.

The value of this method for controlling the milk supply, especially milk which is designed for infant feeding and for butter making is pointed out.

A simple microscopical method for judging the micro-organism content of milk, A. Rosam (*Milchw. Zentbl., 42 (1913), No. 11, pp. 333, 334*).—The method consists of spreading a platinum loopful (of a definite size and weight) of milk (previously heated with an equal volume of methylene blue and a little pyridin in a metal spoon) on a microscopic slide, covering it with a cover glass, and counting the number of bacteria per microscopic field. The number of bacteria are calculated from this finding by means of a formula which is stated. The method is a rapid one.

About the detection of boiled and raw milk, A. Balázs (*Abs. in Chem. Ztg., 37 (1913), No. 54, p. 554*).—The test is as follows:

To 5 cc. of milk add 2 cc. of a copper sulphate solution which contains 69.26 gm. of copper sulphate per liter, shake, and filter; then to 5 drops of the clear and transparent filtrate add Adamkiewicz's reagent (1 part sulphuric acid and 2 parts of glacial acetic acid). Warm carefully without boiling, shake, and allow to stand for a while. The serum of boiled milk remains colorless, while raw milk shows a violet red color. Its greatest intensity occurs within 10 to 15 minutes.

Preliminary report in regard to Römer's work on Schardinger's reaction of cow's milk, W. Rullmann (*Biochem. Ztschr., 48 (1913), No. 1–2, pp. 155, 156*).—A discussion in regard to Römer's work (E. S. R., 27, p. 810) on the occurrence of Schardinger's reaction in the initial milk of cows. See also a previous note (E. S. R., 27, p. 13).

Alteration of milk preserved with potassium bichromate, G. Hinard (*Ann. Falsif., 6 (1913), No. 54, pp. 233–237*).—The changes produced in a milk containing 0.098 per cent of potassium bichromate were studied.

In the total solids a loss of 1 gm. per 100 cc. of milk was noted in six months. The figures for fat or ether extract were very discordant owing to the difficulty of obtaining a homogenous sample of milk. The loss in fat-free dry substance was similar to that of the total solids. The lactose figures for the first two months were very variable and in some cases became higher than at the outset, but after a lapse of six months the losses were very rapid and amounted

to 1.4 gm. per 100 cc. Coagulable casein diminished very rapidly and at the end of about six months it was about 0.61 per cent. The acidity calculated as lactic acid at the outset was 0.23 per cent and after six months it was 0.66 per cent.

The author believes that a study of other antiseptics should be made with a view of substituting one of them for potassium bichromate.

The detection of nitrates in milk samples which are treated with potassium bichromate, J. DOS SANTOS (*Rev. Chim. Pura e Appl., 8 (1912), pp. 181–184; abs. in Chem. Ztg., 37 (1913), No. 4, p. 41*).—Barium chlorid is recommended as a reagent for precipitating the chromate ion. The diphenylamin reaction can then be applied without interference from the chromate.

About the various methods for determining the moisture content of butter fat, F. KÖNIG (*Apoth. Ztg., 28 (1913), No. 7, p. 63*).—The methods studied were (1) Soxhlet's in a Soxhlet drying oven with a current of air; (2) Soxhlet's in a wine drying oven but without a current of air; (3) the aluminum dish method; and (4) the indirect method, which utilizes the difference between the total solids and 100.

The lowest results were obtained by the second and fourth methods, and the highest with the aluminum dish method. In all probability the high results with the Soxhlet method are due to the removal of volatile fatty acids which may have been present in the butter. While the aluminum dish method is satisfactory for commercial analyses, it is deemed of no value for more exact work. The indirect or difference method is the one preferred by the author.

The detection of preservatives in fats (butter, margarin, lard), E. VOLLHASE (*Chem. Ztg., 37 (1913), No. 31, p. 312*).—The author points out that the German Imperial Health Department (E. S. R., 28, p. 762) and the books on food analysis prescribe methods which are time consuming and require a large amount of material. To overcome these difficulties he evolved a method as follows: Fifty gm. of fat is placed in boiling water containing 1 to 2 drops of 15 per cent sodium hydroxid solution and 10 gm. of solid paraffin and shaken thoroughly in order to obtain a fairly uniform distribution of the fat. The mixture is allowed to cool, and if necessary ice used to aid the cooling process. The fat cake is then punctured, the infranatant alkaline fluid filtered through paper, and one-third of the filtrate used for formaldehyde and sulphurous acid tests. The remainder is shaken up with aluminum cream, heated to boiling, and after cooling filtered. A slightly opalescent fluid is thus obtained which is tested for the presence of salicylic, boric, and benzoic acids and their salts, fluorin, and chlorates.

Estimation of solid fatty acids by Hehner and Mitchell's method, A. HEIDUSCHKA and A. BURGER (*Ztschr. Öffentl. Chem., 19 (1913), No. 5, pp. 87–89; abs. in Jour. Chem. Soc. [London], 104 (1913), No. 606, II, p. 351*).—The method, which has been previously noted (E. S. R., 8, p. 861), gives satisfactory results for stearic, palmitic, and myristic acids. When the latter two, however, are to be estimated, they must be dissolved in alcohol to the saturation point. If more than 0.5 gm. of palmitic acid is taken for the estimation, the results are too high. "While the presence of acids which are readily soluble in alcohol does not interfere with the estimation, it is essential that the particular acid under examination should not be mixed with other fatty acids only slightly soluble in alcohol."

About the estimation of solid fatty acids according to Hehner and Mitchell's method, H. SERGER (*Ztschr Öffentl. Chem., 19 (1913), No. 7, pp. 131, 132, fig. 1*).—This is said to be an extension of Heiduschka and Burger's statements noted in the abstract above, and it also includes a description of a filtering and cooling apparatus, which is supposed to increase the efficiency of the method.

Examination of fats, oils, and varnish for technical purposes (*Ztschr. Landw. Versuchsw. Österr., 15 (1912), No. 7, pp. 767–849, figs. 7*).—A detailed description of the methods adopted by the Association of Austrian Agricultural Experiment Stations.

Bromometric determination of formic acid, H. MÄDER (*Apoth. Ztg., 27 (1912), No. 76, pp. 746, 747; abs. in Jour. Soc. Chem. Indus., 31 (1912), No. 20, p. 1006*).—The method depends upon the quantitative oxidation of formic acid to carbonic acid through the agency of bromin.

Activities of the state chemical laboratoy at Göteborg, Sweden, in 1912, J. E. ALÉN (*Årsber. Stadskem. Lab. Göteborg, 1912, pp. 15*).—A description of the activities of this laboratory, which involved the examination of 7,389 samples of miscellaneous substances. These included foods, condiments, waters, chemical and technical products, arsenic, seeds, milk, butter and other fats, canned goods, etc.

Curing meat on the farm, D. T. GRAY (*North Carolina Sta. Circ. 4 (1913), pp. 10, figs. 7*).—This circular gives directions for selecting, killing, scalding, and dressing hogs on the farm, and the methods for brining, smoking, and sacking pork.

METEOROLOGY—WATER.

Brief list of meteorological text-books and reference books, C. F. TALMAN (*U. S. Dept. Agr., Weather Bur. Doc. 512 (1913), pp. 22*).—This is the third edition of this list, previously noted (E. S. R., 22, p. 117). The list is arranged alphabetically by authors in 17 different classes.

The climatic factor as illustrated in arid America, E. HUNTINGTON ET AL. (*Carnegie Inst. Washington Pub. 192 (1914), pp. VI+341, pls. 14, figs. 90*).—Evidence regarding the character and sequence of changes in climate during the last 2,000 or 3,000 years, that is, the period covered by history and man's later development, in the drier portions of America from Guatemala on the south to Idaho on the north is assembled and discussed in this monograph. See also a previous note (E. S. R., 30, p. 416).

The evidence was derived from studies of the influence of the present climatic conditions upon physiography and upon the habits and distribution of plants and animals including man, account being also taken of the relation of the present climatic conditions in the particular region studied to the great climatic zones of the earth as a whole. In connection with the purely physiographic investigations, a study has been made of traces of ancient human occupation in the large number of ruins scattered from the shore of the Gulf of California to the northern limits of New Mexico, as well as in southern Mexico and Yucatan. Data as to climatic changes derived from measurement of sequoias by a method devised by A. E. Douglas, of the University of Arizona, as well as from other tree measurements by the Forest Service of this Department, are also presented.

"A large number of phenomena from the diverse fields of geology, archæology, history, and botany seem to agree in indicating that during the past 3,000 years North America has been subject to pronounced climatic pulsations similar to those which appear to have taken place in Asia and other parts of the Old World. In the temperate portions of the Eastern Hemisphere the climate of the past appears on the whole to have been distinctly moister than that of the present. The change from the past to the present, however, does not seem to have been gradual and regular, but pulsatory or cyclic, so that certain periods have been exceptionally dry, while others have been wet. In America the same appears to be true."

Climatic changes, E. HUNTINGTON (*Geogr. Jour., 44 (1914), No. 2, pp. 203–210*).—This article deals more particularly with what are known as long-period climatic pulsations and progressive dessication of the earth. The general conclusion is that it is not possible to say whether the earth as a whole is becoming wetter or drier. Apparently there has been no general change of climate within historic times.

The meteorological conditions of an ice sheet and their bearing on the desiccation of the globe, C. E. P. BROOKS (*Quart. Jour. Roy. Met. Soc. [London], 40 (1914), No. 169, pp. 53–70*).—The author cites evidence to show that "a well-marked cold period in the north has been associated with increased rainfall over all the more southerly regions for which information is available. . . .

"The regions occupied by extensive ice sheets at the present day, viz, Antarctica and Greenland, are the centers of permanent high-pressure areas, with slight precipitation. We therefore infer that the regions occupied by similar ice sheets in the glacial period were likewise occupied by permanent anticyclones.

"The maximum extent of glaciation occurred at about the same time in different regions of the globe, and also coincided with the maximum of the pluvial period, or period of greater rainfall than the present, in the unglaciated regions. But a general decrease in temperature should lead to a decrease, not an increase, in the amount of evaporation, and hence of precipitation.

"The explanation of the paradox lies in the different distribution of the precipitation. Various causes tended to minimize or reverse the effect of the fall of temperature in decreasing evaporation; thus, while the total precipitation over the globe may have been somewhat less than now, so little of it fell over the ice sheets that the remainder, falling upon the unglaciated areas, rendered these considerably moister than now.

"Since the culmination of the ice age desiccation has progressed with the retreat of the ice. Slight reversals have taken place; an example is the period, cold in the north, moist in the south, from the ninth to the thirteenth centuries."

Recent studies of snow in the United States, J. E. CHURCH, JR. (*Quart. Jour. Roy. Met. Soc. [London], 40 (1914), No. 169, pp. 43–52, fig. 1*).—This is an account of studies made by the Nevada Experiment Station on Mount Rose and in the vicinity of Lake Tahoe (E. S. R., 28, p. 514; 29, p. 814). It describes the snow sampler and weigher used and discusses especially data secured on the relation of mountains and forests to conservation of snow.

It was found that the forested slope of Mount Rose contained "an average water content one-fifth greater than the unforested but protected slope above it, nearly twice as much water as the cornice at the apex of the mountain, over fourteen times the moisture conserved by the wind-swept slope, and more than twice the average water content of all three areas combined. . . .

"Area for area on mountains of gentler contour (and such mountains are the rule rather than the exception) the talus slopes are less efficient than forests as conservers of snow. . . . It is true that some of the snow above timber-line outlasts the snow in the forest below. This phenomenon is confined, however, to the deeper cornices of limited area. The use of timber screens instead of a forest cover evenly distributed would create drifts but little inferior in size and lasting power to the cornices on the talus slopes. Furthermore, the number of such drifts can be multiplied by planting trees, while the cornices on the rocks not only can not be increased in number, but also place too large an area under contribution if compared with the moisture conserved. Their only virtue is that the water they do furnish is released late."

Effect of snow and ice on the temperature of the air, O. V. JOHANSSON (*Öfvers. Finska Vetensk. Soc. Förhandl., 55 (1913–13), Afd. A, No. 1, Art. 11, pp. 64*).—This article discusses in some detail the effect of melting snow and ice on the diurnal and annual variations in temperature of the air, and it is shown that there is a marked influence in this respect.

A quantitative determination of the radium emanation in the atmosphere and its variation with altitude and meteorological conditions, J. R. WRIGHT and O. F. SMITH (*Philippine Jour. Sci., Sect. A, 9 (1914), No. 1, pp. 51–77, fig. 1*).—This is a detailed account of investigations which have been noted from another source (E. S. R., 31, p. 20).

The rainfall of Rhodesia, E. GOETZ (*Proc. Rhodesia Sci. Assoc., 8 (1909), pt. 3, pp. IV+129, pl. 1, figs. 32; rev. in Cairo Sci. Jour., 8 (1914), No. 90, pp. 72, 73*).—This is a more detailed account of investigations which have already been noted from a briefer paper (E. S. R., 30, p. 211.) The available reliable data are compiled and discussed with reference to variation and distribution (periodic and seasonal) and with relation to pressure.

The origin of the rains is also discussed, the conclusion being that "the Indian Ocean winds are the principal rain-bearing winds." A chapter deals with the relation of the rains of Rhodesia to those of German Southwest Africa and Australia and with the Nile floods. The author presents data which he considers indisputable evidence that the rainfall has been less abundant in Rhodesia during the last 10 or 12 years than prior to that time. He also presents data to show that abnormal rainfall on one part of the earth's surface is followed by the same phenomenon somewhere else.

It is shown that dry and wet seasons are clearly defined in Rhodesia. The former extends from May to September, the latter from November to March.

Rainfall, reservoirs, and water supply, A. R. BINNIE (*New York, 1913, pp. XI+157, pls. 2, figs. 54; rev. in Geogr. Jour., 43 (1914), No. 3, pp. 332, 333*).—The earlier chapters of this book deal with such matters as rainfall, drainage systems, catchment areas, floods, and evaporation, while later chapters take up more technical subjects such as reservoir and aqueduct construction, and water storage and supply to houses, in which water is studied in its mechanical properties. A somewhat elaborate discussion is given on the more practical aspects of rainfall study such as mean annual fall, fluctuations from year to year, and the relation of run-off to amount of rain. Other important information is given upon the influence of geological factors on springs and rivers and on the quality of water to be used for economic purposes.

Water resources, W. H. SHERZER (*Mich. Geol. and Biol. Survey Pub. 12, Geol. Ser. 9 (1913), pp. 222–264, pls. 4, figs. 4*).—The surface and underground water supplies of Wayne County, Mich., are discussed with reference to their occurrence, distribution, and availability for industrial and domestic uses.

Surface water supply of the North Atlantic coast basins, 1912, C. C. BABB, C. C. COVERT, and J. G. MATHERS (*U. S. Geol. Survey, Water Supply-Paper 321 (1914), pp. 240, pls. 3*).—This report presents results of measurements of flow made on the St. John, St. Croix, Machias, Union, Penobscot, Kennebec, Androscoggin, Presumpscot, Saco, Merrimac, Blackstone, Connecticut, Housatonic, Hudson, Delaware, Susquehanna, Patuxent, Potomac, and Rappahannock river basins during 1912.

Surface water supply of the Ohio River basin, 1912, A. H. HORTON, W. E. HALL, and H. J. JACKSON (*U. S. Geol. Survey, Water-Supply Paper 323 (1914), pp. 118, pls. 2*).—This paper reports results of measurements of flow made on the Ohio River and its tributaries during 1912. Tables are also included giving gage heights and daily and monthly discharges at each station.

Surface water supply of upper Mississippi River and Hudson Bay basins, 1912, A. H. Horton, W. G. Hoyt, and H. J. Jackson (*U. S. Geol. Survey, Water-Supply Paper 325 (1914), pp. 193, pls. 2*).—This report presents the results of measurements of flow made on the Hudson Bay drainage area in the United States and the upper Mississippi River drainage basin during 1912. Daily and monthly discharges at each station are given.

Surface water supply of the United States, 1912.—VII, Lower Mississippi River basin, R. Follansbee (*U. S. Geol. Survey, Water-Supply Paper 327 (1914), pp. 84, pls. 2*).—This paper presents results of measurements of flow made on the Arkansas River, Yazoo River, and Red River basins and their tributaries, during 1912. In addition are given daily gage heights at each station.

Surface water supply of western Gulf of Mexico basins, 1912, W. W. Follett, R. Follansbee, and G. A. Gray (*U. S. Geol. Survey, Water-Supply Paper 328 (1914), pp. 121, pls. 2*).—This paper reports measurements of flow made on the Rio Grande, Saguache, San Luis, Kerber, Rio Alamosa, Conejos, Costilla, Rio Colorado, Rio Hondo, Rio Pueblo de Taos, Rio Taos, Rio Lucero, Rio Fernando, Chama, Brazos, Horn, Rio Vallecitos, Rio Puerco, Bluewater, San Jose, Pecos, Devils River, Rio Salado, and Rio San Juan basins and several interior basins of New Mexico. Daily and monthly discharges are given for each station.

Clean water and how to get it, A. Hazen (*New York and London, 1914, 2. ed. rev. and enl., pp. XII+196, pls. 18; rev. in Engin. Rec., 69 (1914), No. 15, p. 429*).—The second edition of this work (E. S. R., 19, p. 513) contains additional chapters on the so-called redwater troubles and on water sterilization.

The mechanical filtration of moorland water supplies, and the action of water on lead, A. S. Delépine (*Jour. Roy. Sanit. Inst., 35 (1914), No. 3, pp. 117–132*).—In experiments with unpolluted moorland water supplies having a marked action on lead the author found that chemical precipitation combined with mechanical filtration removed all discoloration, reduced more or less the total number of bacteria, and satisfactorily corrected the action on lead.

Sterilization of water by filtration, K. Charitschkoff (*Chem. Ztg., 38 (1914), No. 20, p. 222; abs. in Gsndhts. Ingen., 37 (1914), No. 12, p. 218*).—The author found that all porous substances form hydrogen peroxid in the presence of water. He points out that the sterilizing effect of ultra-violet light on water depends chiefly on the formation of hydrogen peroxid, and states that the same result can be obtained by filtering water through pumice stone, asbestos, or horizontally through a metal brush.

SOILS—FERTILIZERS.

Field operations of the Bureau of Soils, 1911 (thirteenth report), M. Whitney et al. (*U. S. Dept. Agr., Field Operations of the Bureau of Soils, 1911, pp. 2356, pls. 27, figs. 61, maps. 50*).—This report contains a general review of the field operations of the Bureau of Soils during 1911 by the chief of the Bureau, together with detailed accounts of the following surveys:

Plymouth County, Mass., by W. E. McLendon and G. B. Jones; Windham County, Conn., by W. E. McLendon; Jefferson County, N. Y., by M. E. Carr et al.; Bedford County, Pa., by C. J. Mann and W. E. Gross; Bradford County, Pa., by P. O. Wood et al.; a reconnoissance soil survey of northeastern Pennsylvania, by C. F. Shaw et al.; the Sussex area, N. J., by H. Jennings et al.; Richmond County, N. C., by R. B. Hardison et al.; Johnston County, N. C., by W. E. Hearn and L. L. Brinkley; Fairfield County, S. C., by M. E. Carr et al.; Georgetown County, S. C., by W. E. McLendon et al.; Chatham County, Ga., by W. J.

Latimer and F. S. Bucher; Glynn County, Ga., by D. D. Long and J. E. Ferguson; Columbia County, Ga, by C. N. Mooney and A. E. Taylor; Chilton County, Ala., by L. Cantrell and W. E. Wilkinson; Elmore County, Ala., by R. A. Winston and A. C. McGehee; Jackson and Marshall counties, Ala., by C. S. Waldrop and N. E. Bell; Madison County, Ala., by R. T. A. Burke and A. M. O'Neal, jr.; Mobile County, Ala., by G. B. Maynadier et al.; Randolph County, Ala., by R. T. A. Burke et al.; Tuscaloosa County, Ala., by R. A. Winston et al.; Forrest County, Miss., by W. E. Tharp and W. M. Spann; Wayne County, Miss., by A. L. Goodman et al.; Lowndes County, Miss., by H. C. Smith and A. L. Goodman; Iberia Parish, La., by C. J. Mann and L. A. Kolbe; reconnoissance soil survey of southwest Texas, by A. E. Kocher et al.; the Huntington area, W. Va., by W. J. Latimer; the Morgantown area, W. Va., by C. N. Mooney and W. J. Latimer; Columbia, Fond du Lac, Juneau, Kewaunee, and La Crosse counties, Wis., by W. J. Geib et al.; Franklin County, Mo., by E. S. Vanatta and H. G. Lewis; Laclede County, Mo., by D. D. Long et al.; Macon County, Mo., by H. Krusekopf and F. S. Bucher; Platte County, Mo., by A. T. Sweet et al.; soil reconnoissance of the Ozark region of Missouri and Arkansas, by C. F. Marbut; reconnoissance survey of western Nebraska, by T. D. Rice et al.; Reno County, Kans., by W. T. Carter, jr., et al.; Shawnee County, Kans., by W. C. Byers and R. I. Throckmorton; reconnoissance survey of southwestern Washington, by A. W. Mangum et al.; Quincy area, Wash., by A. W. Mangum et al.; and Medford area, Oreg., by A. T. Strahorn et al.

During the calendar year 1911, 34,743 square miles, or 22,235,520 acres, were surveyed and mapped in detail on a scale of 1 in. to the mile, making the total area surveyed and mapped up to the end of that year 249,246 square miles, or 159,517,440 acres. There were also conducted reconnoissance surveys covering an area of 131,900 square miles, or 84,416,000 acres.

The white soils of the Bram and Reinhard forests in the colored sandstone regions of the upper Weser River, K. Vogel von Falckenstein (*Internat. Mitt. Bodenk., 4 (1914), No. 2–3, pp. 105–137, figs. 4*).—The author briefly describes the colored sandstones of middle and southern Germany and discusses the chemical compositions of some of their supposed weathered products, particularly the white soils, chemical analyses of which he compares with those of the colored sandstones and bleached and ortstein soils. The white soils were richer in clay than the sandstone but differed little in regard to the amounts of other mineral constituents present. In contrast to a typical bleached and ortstein soil, the alkali and other salts tended in a measure to concentrate in the upper layer of the white soil, as did also the weathered clay.

It is concluded that the white soils are not related to the bleached and ortstein soils, and that regardless of their greater clay content they are weathered products of the hard colored sandstone. However, the author distinguishes between real and pseudo-white soils, classing as the former those white soils consisting of a loose upper layer and a dense substratum which do not differ widely chemically, and as the latter, soils consisting of a true white soil upper layer and a clay substratum which differ chemically and are of different origin.

See also a previous note (E. S. R., 30, p. 514.)

The origin of the red soils of diluvial times, E. Blanck (*Jour. Landw., 62 (1914), No. 2, pp. 141–147*).—A more detailed report on this subject has been previously noted (E. S. R., 29, p. 514).

Rutherglen Experiment Farm—Report on permanent experiment field, season 1913, A. E. V. Richardson (*Jour. Dept. Agr. Victoria, 12 (1914), No. 3, pp. 142–153, figs. 4*).—Chemical analyses of samples of soil from the experimental field in their natural state show the soil to be "deficient in nitrogen, lime, and potash, and extremely deficient in phosphoric acid," as compared with

arbitrary standards of fertility of average European soils. Their mechanical composition also is said to be unfavorable for cultivation.

Methods for soil investigation, R. ALBERT and O. BOGS (*Internat. Mitt. Bodenk., 4 (1914), No. 2–3, pp. 181–198*).—Comparative tests of methods for determining the humus and water content and specific weight of soils are reported, the object being to determine the simpler and quicker methods which are equally satisfactory for soils of different origin and history.

For humus determination the simplified method of elementary analysis by burning in a stream of oxygen, according to Dennstedt, is concluded to be the most generally satisfactory. As regards water content it is concluded that with sandy soils the determination by drying in an air bath at 105 to 106° C. is sufficiently exact, while for loam, clay, and moor soils Schwalbe's method of distillation with xylol is preferable. For specific weight determination is preferred the simplified method of Wrochem, which is based on the principle that pulverized and absolutely dry substances, such as cement, etc., are easily freed of their air content by immersion in turpentine.

The physical properties of soils, J. KOPECKÝ (*Internat. Mitt. Bodenk., 4 (1914), No. 2–3, pp. 138–180, figs. 4*).—The author discusses the importance in soil judgment of determining the physical properties of soils, draws attention to the many inaccuracies in several of the commonly used methods, and describes methods and apparatus developed by him for determining the water capacity, apparent and real specific weights, porosity, air capacity, and permeability of soils.

It is concluded that the absolute water capacity of a certain type of soil in nature, excluding all outside influences, may be expressed by the amount retained after 24 hours following saturation, and that the air retained in the remaining pore space serves to indicate the air capacity. On the basis that permeability is that property which permits the soil to retain its absolute capacity of water and allow all excess to escape by percolation, relative permeability is expressed as the quantitiy of water in cubic centimeters which will percolate through a cross section of 100 sq. cm. of a soil column 10 cm. high in 24 hours.

The absorptive power of soils, P. ROHLAND (*Biochem. Ztschr., 63 (1914), No. 1, pp. 87–92*).—The author discusses the properties of soil colloids and defends the colorimetric method for determining the absorptive power of soils, particularly kaolin. The absorptive power of kaolin is said to be a measure of its other properties, especially its plasticity.

The nature of drought according to the evidence of the Odessa experiment field, V. G. ROTMISTROV (*Sushchnost Zasukhi po Dannym Odesskago Opytnago Polia. Odessa, Russia, Russian Ed., 1911, pp. 66, figs. 21; English Ed., 1913, pp. 48, figs. 21*).—A continuation of work begun in 1905 is reported and results of previous investigations are summarized. The method of investigation is described and laws of the circulation of water, the root systems of plants in relation to the water of the soil, and methods of combating drought are discussed. The conclusions reached are based upon over 60,000 determinations of water in soils under different conditions of cropping and drought.

The author separates the soil zone in which the roots of plants grow into three layers, which are, beginning at the surface, (1) the periodically humid layer variable in depth, (2) the intermediate dry layer extending to a depth of from 63 to 71 in., and (3) the permanently humid layer below (2). He concludes that water percolating beyond a depth of from 16 to 18 in. does not return to the surface except by means of the roots of plants, and that all water not so utilized goes down into the deeper layers of the soil.

Under normal conditions the network of roots is very uniform throughout the soil layer which they occupy, but in order that this may be true and the

growth of the plants not interfered with, the soil zone occupied by the roots must be uniformly supplied with a sufficient quantity of available water (as a rule more than 10 per cent in the clay soil experimented with).

The depth of the moist layer at seedtime in the spring is of vital importance in relation to subsequent droughts. It was found in the experiments at Odessa, where the useful rainfall is only about 5.85 in., that every year at the end of June or at the beginning of July, and with a dry spring season at the end of May, cereals have consumed all of the reserve water which had accumulated in the root zone in the preceding autumn, winter, and spring, and that with continuous culture of cereals there was a pronounced and complete drying of the soil of the root zone and almost complete cessation therein of formation of soluble plant food.

An elaborate study of the distribution of roots of different kinds of plants in the soil (E. S. R., 20, p. 732) showed wide differences in the depth and extent to which different plants exhausted the soil moisture. Potato and flax roots were found to grow to a depth of approximately 2½ ft., sunflowers and beets about 4½ ft., and most cereals about 3½ ft.

On the basis of his studies of the root systems of plants and their relation to the exhaustion of soil moisture the author recommends very strongly rotations which will alternate short-rooted and dense-rooted crops with those having longer and more scattering root systems.

The conditions conducive to drought are summarized in brief as follows: (1) Uneven distribution of moisture in the soil zone at the time of seeding, (2) persistent and perennial dryness of the intermediate layer of the soil and a deficiency of soluble plant food therein as a result of continuous cropping with the same kind of plants, and (3) great depth of the permanent water table.

Among the measures recommended for lessening or controlling the effects of drought in addition to the rotation of crops of different rooting habits, already referred to, are surface tillage and the destruction of weeds, the latter being considered "the bitterest enemy of . . . field culture and the best friend of drought."

It is pointed out that A. Shishkin about forty years ago formulated quite fully the means of combating drought, anticipating much that is now current practice in dry farming.

Forests and floods. J. Aitken (*Nature [London], 93 (1914), No. 2333, p. 506*).—Tests with garden soil in pots are reported to show that stirred soil absorbs and retains much more moisture than compact, undisturbed soil, and it is maintained that soils under trees are loosened by the constant growth and expansion of the roots and thus put into condition for absorbing and retaining more rainfall than bare soils.

The chemistry of the soil: The evolution of acid amins, G. Chardet (*Rev. Gén. Chim., 17 (1914), No. 9, pp. 137–144*).—This article discusses the theoretical and practical value of the determination of acid amins in soils, reviewing briefly the chemistry of the metabolism of these substances, their evolution, and their transformation into products which are either toxic or fertilizing to plants. Attention is also called to the numerous points of similarity between the nutrition of the plant cell and the animal cell and the relation thereto of nutritive substances and excretory products.

The application of the Sörensen method for the rapid determination of acid amins in the study of soils is discussed and examinations of the nitrogenous compounds of four soils by this means are reported. It was found that the proportion of nitrogen in the form of acid amins varied from 49 per cent of the total nitrogen in peat to 52 per cent in swamp soil, 66 per cent in humus garden soil, and 68 per cent in compost.

Special reference is made to the work of the Bureau of Soils of this Department on the subject.

The effect of soluble humates on nitrogen fixation and plant growth, W. B. BOTTOMLEY (*Rpt. Brit. Assoc. Adv. Sci., 1913, pp. 777, 778*).—A continuation of previous experiments is reported (E. S. R., 30, p. 323). Data obtained from pot and field experiments with the so-called "bacterized" peat prepared by the author's method are presented to show that this material not only promotes nitrogen fixation in the soil but has a direct effect in increasing the growth of plants, and it is stated that "this is probably due in part to the presence of ammonium humate, which, in addition to being a direct source of nitrogen for plants, stimulates their root development in a remarkable manner."

Nitrification in pasture soils, C. T. GIMINGHAM (*Rpt. Brit. Assoc. Adv. Sci., 1913, p. 777; abs. in Nature [London], 92 (1914), No. 2305, p. 516*).—A study of nitrification was made in a soil intermediate in character between the true moor and the true fen soil. This soil contained a large amount (30 to 40 per cent) of organic matter and only traces of carbonate, but the soil water was neutral in reaction. The soil was found to be capable of bringing about immediate and rapid nitrification of peptone. Ammonium sulphate was also quickly nitrified, but the soil in this case became slightly acid in reaction.

A note on the use of nitron in the determination of nitrates in the soil is appended.

Investigations on the protozoa of soil, T. GOODEY (*Rpt. Brit. Assoc. Adv. Sci., 1913, p. 775; abs. in Jour. Soc. Chem. Indus., 32 (1913), No. 18, p. 919; Nature [London], 92 (1914), No. 2305, p. 516*).—A rapid method for obtaining protozoa from a hay-infusion culture of soil was devised. The organisms first obtained by this method were ciliated protozoa, chiefly Colpoda. The indications were that these protozoa were present in soil only in an encysted condition and, therefore, could not inhibit bacterial activity.

Partial sterilization by means of volatile antiseptics had no effect on the rate of development of bacteria in a soil which had been kept in bottles since 1846 and contained no protozoa, but a soil kept since 1870 which contained a few protozoa (amœba and flagellates) was improved in bacterial activity by partial sterilization.

Improvement of swamp land in Finland by addition of sand, A. RINDELL (*Finska Mosskulturför. Årsbok, 16 (1912), No. 2, pp. 181–188; abs. in Jour. Soc. Chem. Indus., 33 (1914), No. 8, p. 432*).—"Experiments with oats extending over two years showed that loam is much superior to sand as an addition to unmanured marshy land. The addition of sand did not produce any improvement unless more than 400 cubic meters per hectare (about 5,700 cu. ft. per acre) was added. If the land was otherwise provided with phosphates and potash, the difference in effect between sand and loam was not appreciable."

Greater profits from land, A. L. DRYSDALE (*Edinburgh, London, and Leipsic, 1914, pp. VIII+187, pls. 7*).—This is primarily a summary of results of agricultural investigations carried on at the Dalmeny Experiment Station in Scotland during eight years beginning in 1895, with an introductory chapter discussing some features of recent progress in agricultural science and tables showing how the unexhausted value of applications of manure and fertilizers may be estimated.

New views on fertilization (*Mitt. Deut. Landw. Gesell., 29 (1914), Nos. 10, pp. 145–147; 11, pp. 154–156; 12, pp. 171–173; 13, pp. 181–183; 14, pp. 196, 197; 15, pp. 207, 208; 16, pp. 216–218; 17, pp. 230, 231; 19, pp. 259, 260; 21, pp. 292, 293; 23, p. 337*).—This is a symposium on this subject contributed by a number of the more prominent investigators in the field of soil fertility and fertilization.

Fertilizers, fungicides, and insecticides, C. PLUVINAGE (*Industrie et Commerce des Engrais et des AntiCryptogamiques et Insecticides. Paris, 1912, pp. XII+543, figs. 269*).—This is one of the volumes of the *Encyclopédie Agricole* published under the direction of G. Wery. It deals quite fully with the sources, nature, production, manufacture, and consumption of the principal fertilizing materials, namely, sodium and other nitrates, ammonium sulphate, synthetic nitrogenous compounds, phosphates, and potash salts. It also discusses the nature and use as fertilizer of garbage, poudrette, oil cakes, dried blood, tankage, horn, leather, and wool refuse, guanos, so-called humic fertilizers, and mixed fertilizers. Under the head of fungicides and insecticides sections are devoted to copper and iron sulphates, sulphur, carbon disulphid, and sulphocyanates.

The sections relating to sodium nitrate, ammonium sulphate, and the phosphates are especially complete.

A short bibliography is given but no index, a detailed table of contents taking the place of the latter.

Chemical fertilizers in the Canary Islands, H. BRETT (*Daily Cons. and Trade Rpts. [U. S.], 17 (1914), No. 95, pp. 443–445*).—Statistics of consumption of fertilizers in these islands during the years 1910–1912, inclusive, are briefly summarized.

In 1912 the fertilizer imports amounted to 14,177 metric tons, over one-half coming from England.

Identification of commercial fertilizer materials, W. H. FRY (*U. S. Dept. Agr. Bul. 97 (1914), pp. 13*).—The methods and equipment required for the microscopic identification of the principal fertilizing materials are described and optical constants for the materials are given. It is stated that the methods described are those of the simplest and most accessible nature and that with their aid and a little practice anyone should soon be able to determine many of the materials ordinarily used in the manufacture of fertilizers.

Experiments in fertilizing with stable manure, A. VON LIEBENBERG (*Wiener Landw. Ztg., 64 (1914), No. 13–14, pp. 120–122*).—The results of a large number of experiments are summarized in this article, a conclusion of general interest being that it is profitable in many cases to use comparatively small applications of manure.

Guano and national agriculture, J. A. DE LAVALLE Y GARCIA (*El Guano y la Agricultura Nacional. [Lima, 1913], pp. 111*).—This is a series of papers dealing with the guano deposits of Peru and their relation to the national welfare, including also information regarding the extent, exploitation, and protection of these deposits.

Peruvian output of guano (*Daily Cons. and Trade Rpts. [U. S.], 17 (1914), No. 175, p. 559*).—It is stated that the output of high-grade guano by the company administering the guano deposits of Peru was 31,486 tons in 1913–14 as compared with 24,350 tons the previous year. The corresponding outputs of low-grade guano containing less than 3 per cent nitrogen were 7,301 and 12,242 tons.

The seaweed industry of France, J. B. OSBORNE (*Daily Cons. and Trade Rpts. [U. S.], 17 (1914), No. 152, pp. 1988–1990*).—The use of seaweed as fertilizer, which is stated to be quite general all along the French coast, is discussed.

New sources of nitrogen, D. A. GILCHRIST (*County Northumb. Ed. Com. Bul. 21 (1914), pp. 89, 90*).—Comparative tests of sodium nitrate, calcium nitrate, calcium cyanamid, and ammonium sulphate at Cockle Park during several years are reported, but no conclusions are drawn from the data reported except that

while calcium cyanamid is a useful nitrogenous fertilizer it should not be applied as a top-dressing but spread evenly and worked into the surface soil at least ten days before the crop is sown.

Synthetic ammonia by the Serpek method, HERRE (*Chem. Ztg., 38 (1914), Nos. 29, pp. 317, 318; 31, pp. 341–344, fig. 1*).—The development and industrial value of this method is discussed. A short bibliography of the subject is given.

Experiments with nitrogenous fertilizers, E. HASELHOFF (*Landw. Vers. Stat., 84 (1914), No. 1–2, pp. 1–55*).—Five years' field experiments with different crops and soils were made to determine the relative fertilizing value of lime nitrogen, nitrogen lime, urea and guanadin and their nitrates, calcium nitrate with and without free lime, sodium nitrate, potassium nitrate, ammonium nitrate, sodium nitrite, ammonium sulphate, Burkheiser salt, and galalith waste are reported.

The effect of the different fertilizing substances varied with the time and method of application, the season, and the kind of crop. In general, sodium nitrate and ammonium sulphate were about equal in effect, better results being obtained on loam soil than on sand, and from deep and fall applications rather than from surface and spring applications. Calcium nitrate was equal to and sometimes superior to sodium nitrate and gave better results on sand than on loam. Adding salt increased the beneficial effect of the calcium nitrate. Potassium nitrate and ammonium nitrate were as effective as sodium nitrate. Sodium nitrite was not equal to the nitrate in fertilizing effect, but it was so little inferior to the latter that it is thought that the small amount of nitrite sometimes occurring in calcium nitrate is likely to have a negligible effect upon the fertilizing value of the latter. Lime nitrogen in deep applications in the fall gave as good results as sodium nitrate, but was much less effective when applied as a top-dressing in the spring. Urea and guanadin and their nitrates were inferior to sodium nitrate. Burkheiser salt (containing cyanids in addition to ammonium sulphate) was inferior in fertilizing effect to ammonium sulphate. The waste in the manufacture of articles from galalith (indurated casein) was decidedly inferior to the nitrate, especially when used in coarse form on sandy soils.

The utilization of the nitrogen of these different substances by crops is discussed in detail in the article.

Comparative results with different phosphatic manures, D. A. GILCHRIST (*County Northumb. Ed. Com. Bul. 21 (1914), pp. 35–43*).—Summarizing the results of several years experiments with different crops at the Cockle Park Experiment Station it is stated that high citric acid solubility in case of phosphatic slags is not a sure index of greater fertilizing efficiency. While somewhat contradictory, the results indicate that high lime content in slags is advantageous and that high iron content is not disadvantageous. Both Tunisian and Belgian phosphates gave quite satisfactory results, the latter especially when it had been calcined. The indications were that the same amount of phosphate applied as a mixture of basic slag and superphosphate may give better results than when all the phosphate is applied as slag.

The fertilizing action of the phosphoric acid of steamed bone meal, T. ALEXANDER (*Monatsh. Landw., 7 (1914), Nos. 1–2, pp. 20–24; 3–4, pp. 67–73*).—In experiments on grass lands it was found that the phosphoric acid of steamed bone meal was in no case inferior but in a few cases superior to that of Thomas slag, and this was true even in case of soils well supplied with lime.

The reserve supply of phosphate rock in the United States, W. H. WAGGAMAN (*Jour. Indus. and Engin. Chem., 6 (1914), No. 6, pp. 464, 465*).—Including all rock containing from 58 to 78 per cent of "bone phosphate of lime," it is estimated that the total reserve supply of phosphate in the United States is

equivalent to 10,519,875,000 tons of high-grade rock. This is stated to be distributed as follows: Utah, Idaho, Wyoming, and Montana—high grade 2,500,000,000, high-grade equivalent of all grades, 7,500,000,000 tons; Florida—high-grade equivalent of all grades, 354,300,000, high-grade equivalent of wash heaps, 20,000,000 tons; Tennessee—high-grade equivalent of all grades, 115,075,000 tons; South Carolina—high-grade equivalent of all grades, 10,000,000 tons; Arkansas—high-grade equivalent of all grades, 20,000,000 tons; and Kentucky—high-grade equivalent of all grades, 500,000 tons.

The composition of the Wittelsheimer potash salts and their use in agriculture, P. KULISCH (*Ztschr. Angew. Chem., 27 (1914), No. 53, Referatenteil, p. 413*).—From numerous analyses it is shown that the potash salts of the Alsatian deposits are mainly a mixture of potassium chlorid, 25 to 30 per cent, and sodium chlorid, 55 to 65 per cent. Therefore, the salts should not be used on crops injuriously affected by chlorin. They also contain a considerable percentage of calcareous clay and are, therefore, not suitable for use in fertilizer mixtures.

The importance and value of phonolite as a fertilizer, O. LEMMERMANN (*Arb. Landw. Kammer Prov. Brandenburg, No. 35 [1914], pp. 39*).—Reviewing the results of experiments with this material, it is concluded that, while phonolite has a certain value as a potash fertilizer, it does not compare in cheapness and efficiency with the ordinary potash salts.

Kelp production in United Kingdom, J. L. GRIFFITHS (*Daily Cons. and Trade Rpts. [U. S.], 17 (1914), No. 134, pp. 1402–1405*).—Brief accounts are given of the collection and use of kelp in various parts of the United Kingdom.

Extensive use is made of kelp as a fertilizer in the island of Jersey, particularly in connection with the potato crop. In the Scilly Islands, on account of the lightness of the soil, as much as 50 long tons of seaweed are frequently applied per acre for early potatoes, nearly as much for mangolds and other root crops, and somewhat less for grain crops. The use of seaweed ash for the manufacture of iodin has been largely superseded by the preparation of this substance from Chilean nitrate, although iodin is still manufactured to some extent from seaweed ash in Scotland. Lately, however, a process for obtaining the iodin directly from the seaweed by distillation with superheated steam has been proposed.

Methods of burning seaweed and the species best suited to kelp making are discussed.

The partial sterilization of the soil by means of caustic lime, H. B. HUTCHINSON and K. MACLENNAN (*Rpt. Brit. Assoc. Adv. Sci., 1913, pp. 774, 775*).—The investigations of which this is a brief account have been noted from another source (E. S. R., 29, p. 730).

Carbonic acid as a fertilizer, G. QUARRIE (*Commercial Fert., 8 (1914), No. 6, p. 26c*).—Garden experiments in which one plat of soil was treated with carbon dioxid forced into it through underground pipes and another was untreated with gas but abundantly supplied with stable manure are reported.

The crops grown were potatoes, cabbages, Brussels sprouts, and privet. The treated plat yielded a little over one-third more potatoes than that which received only manure, and the potatoes were of better quality. The effect of the treatment was pronounced in the case of all of the other crops.

AGRICULTURAL BOTANY.

Formation of chlorophyll in plants, II, N. MONTÉVERDÉ and W. LUBIMENKO (*Izv. Imp. Akad. Nauk (Bul. Acad. Imp. Sci. St. Pétersb.), 6. ser., No. 9 (1912), pp. 609–630; abs. in Jour. Chem. Soc. [London], 102 (1912), No. 598, II, pp. 800,*

801).—Previous investigations of the authors (E. S. R., 21, p. 726) have shown that formation of chlorophyll in green plants proceeds by definite stages and that the phenomena are very complicated from a chemical point of view.

In the present paper they give the results of investigations in the formation of chlorophyll in green plants. It is stated that this involves two stages. The first includes the reactions by which the colorless leucophyll is converted into colored chlorophyllogen without the direct action of light. The second stage consists of chemical or photochemical transformations by which chlorophyllogen is converted into chlorophyll itself. With the conifers and other plants which become green in the dark the chlorophyllogen is acted on by unknown chemical reagents, but with most green plants the energy required for the transformation of chlorophyllogen into chlorophyll is supplied by light.

The part played by light has been found a complicated one. The maximal accumulation of chlorophyll corresponds with an optimal light intensity, the value of which varies with different species of plants. With excessive intensity of light both etiolated and noneticlated plants were found to turn green more slowly, and the latter exhibited a kind of adaptation to strong light which showed itself in accelerated accumulation of chlorophyll during the development of the young plants. Chlorophyll accumulated by leaves developed in daylight was found to possess considerable resistance to strong light. Brief exposure of etiolated plants to strong sunlight retarded their subsequent greening under the influence of diffused light. A well-defined relation was found to exist between chlorophyll and the yellow pigments accompanying it, and in general the accumulation of each is influenced by the same factors. The pigments are not combined chemically with chlorophyll, so that the destruction of the latter in autumn leaves does not affect the yellow pigment.

Formation of chlorophyll in plants, III. N. A. Monteverdé and V. N. Lubimenko (*Izv. Imp. Akad. Nauk (Bul. Acad. Imp. Sci. St. Pétersb.), 6. ser., No. 17 (1913), pp. 1007–1028. fig. 1; abs. in Jour. Chem. Soc. [London], 106 (1914), No. 616. I, pp. 240, 241*).—A description is given of an improved apparatus for carrying out the spectro-colorimetric estimation of chlorophyll, xanthophyll, and carotin as described in a previous publication (E. S. R., 24, p. 718). By means of the apparatus the amounts of the above pigments were determined in fresh leaves of a considerable number of plants representing quite a range of plant families.

The authors also report investigations on the influence of various constituents of the ash of plants on the extent to which the leaves turn green, this being measured by the proportion of chlorophyll present. Two series of experiments were made, one with etiolated Luffa seedlings and the other with etiolated wheat seedlings. With the first all the potassium salts used caused marked increases in the amount of chlorophyll formed, while magnesium sulphate produced a slight increase. Calcium or magnesium nitrate brought about a considerable decrease in chlorophyll formation, while sodium nitrate gave a small decrease. The presence of sodium dihydrogen phosphate resulted in a large increase. In the experiments with wheat seedlings magnesium sulphate, potassium permanganate, or dihydrogen phosphate had no effect on the amount of chlorophyll formed, while potassium nitrate had but a slight positive influence.

Hydrocyanic acid in plants.—II, Its occurrence in the grasses of New South Wales, J. M. Petrie (*Proc. Linn. Soc. N. S. Wales, 38 (1913), pt. 4, pp. 624–638*).—In continuation of a previous paper (E. S. R., 28, p. 36) the author reports on the occurrence of hydrocyanic acid in plants of New South Wales.

The present paper is confined to a study of grasses. In addition to its occurrence in species that are naturalized or cultivated in New South Wales, the

author adds 17 species which are recorded for the first time as containing a cyanogenetic glucosid and the correlated enzym.

The influence of increased carbon dioxid content of the air on green plants, H. FISCHER (*Jahresber. Ver. Angew. Bot., 11 (1913), pt. 1, pp. 1–8*).—Studies with plants under glass subjected to an increased density of carbon dioxid in the surrounding atmosphere are said to have produced, in almost all experiments, a notable increase in body growth by the plant; earlier and more abundant flowering and fruit in several cultivated species; fruit bearing by ordinarily sterile hybrids; and greater resistance to parasites.

The controlling influence of carbon dioxid in the maturation, dormancy, and germination of seeds, I. F. KIDD (*Proc. Roy. Soc. [London], Ser. B, 87 (1914), No. B 597, pp. 408–421, fig. 1; abs. in Gard. Chron., 3. ser., 56 (1914), No. 1437, p. 34*).—Experiments described are claimed to show that a high content of carbon dioxid in the atmosphere retards or inhibits germination of seeds without injury thereto. The seeds may germinate at once after removal of the carbon dioxid, as in case of beans, cabbage, barley, peas, and onions, or inhibition may continue indefinitely after removal of the inhibitory carbon dioxid pressures. In some cases described it was terminated only by complete drying and rewetting, or by removal of the testa. In such cases a lowering of the permeability of the testa to gases is thought to occur, reducing the admission of oxygen to the embryo and raising relatively the actual carbon dioxid pressure in the embryo tissues. The production of carbon dioxid in nature by decay of vegetable matter may, it is thought, play a part analogous to that noted in these experiments.

The growth of potatoes in a medium containing but little humidity and very little light, H. HUA (*Bul. Soc. Bot. France, 60 (1913), No. 7, pp. 621–623*).—A description is given of the growth of three potato tubers left by accident in a cave during the summer. Long, thin, etiolated shoots appeared and from near their bases short branches were put out which bore tubers at their extremities. No roots were observed to be formed, but in the absence of absorption from the soil and assimilation through aerial organs about 50 tubers were formed that weighed from 4 to 30 gms. each. The original weight of the tubers was unknown.

Decalcification of soils by smoke and effect thereof on plants, A. WIELER (*Jahresber. Ver. Angew. Bot., 10 (1912), pp. 58–74, figs. 6*).—The effects of smoke gases on the development of lupine, vetch, pine, oak, and beech are shown and discussed. It is claimed that acids contained in the fumes may injure forest trees, not alone directly, by their action on the foliage, but indirectly, by forming soluble compounds with bases in the soil, thus permitting valuable constituents to be carried away in the drainage. Calcium was found to be notably deficient in soils examined which were unable to support forest growth.

The relative abundance of bacteria in forest soils and the influence of soil characters on their development, A. RÄUBER (*Forstw. Centbl., n. ser., 36 (1914), No. 4, pp. 195–208*).—A study of bacterial flora of different soils at varying depths in 1913 is said to show that the bacterial content of limy forest soils in the upper layers is from ten to twenty times as high as in sandy soils, and varies considerably with the depth. The relative smallness of the number at or very near the surface is attributed to the development of humus acids there, as noted by Migula (E. S. R., 29, p. 325). The importance of the influence of soil bacteria as regards decomposition varies greatly with local and temporal circumstances.

The rôle of winter temperatures in determining the distribution of plants, F. SHREVE (*Amer. Jour. Bot., 1 (1914), No. 4, pp. 194–202, fig. 1*).—The author has carried out some preliminary investigations on the importance of the temperature phases of the past season in determining the distinct distributional limits of some subtropical desert plants.

Studies previously noted (E. S. R., 25, p. 732) with succulent plants native to various altitudes in southern Arizona, indicate, it is claimed, that within the limits of the species tested the number of hours that they are exposed to temperatures below freezing determines their survival or death without regard to the absolute minimum reached during the freezing period (although minima below 18° F. were not used). It is stated also that the succulents which have the lowest vertical limit of distribution are unable to resist freezing for more than 19 to 22 hours in duration, while species of higher limits are progressively able to withstand longer periods of freezing, up to about 66 hours, but that *Opuntia missouriensis* withstood 375 consecutive hours of freezing at Havre, Mont., in 1910–11. It is suggested that further studies in this direction may furnish a knowledge of the underlying causes of the phenomena of distribution.

The wilting coefficient of the soil, V. H. BLACKMAN (*Jour. Ecology, 2 (1914), No. 1, pp. 43–50*).—This is mainly a review of some recent contributions dealing with soil moisture in relation to plant needs as affected by the various factors involved, in particular an article by Briggs and Shantz (E. S. R., 26, p. 628).

Changes produced in the sap by the heating of branches, H. H. DIXON (*Sci. Proc. Roy. Dublin Soc., n. ser., 14 (1914), No. 15, pp. 224–228*).—Comparisons were made of the sap of branches killed by heating with steam in the case of beech, poplar, and Ilex, and it was found that the steaming brought about a change in the depression of the freezing point, a decided increase in conductivity, a marked increase in acidity, a change in color, and the destruction of oxidase. The sap of steamed branches from a number of different species of plants was centrifugally extracted and tested on the leaves of *Elodea canadensis*, comparisons being made with fresh sap. In nearly every instance destructive changes were brought about in the leaves within two or three days.

The evidence drawn from these experiments indicates that leaves above a steamed branch perish not because they are cut off from their water supply, but because profound changes have been produced in the sap, resulting in the production of poisonous substances. The drying of the poisoned leaves is believed to be caused by the partial or complete plugging of the water channels by colloids exuded from the heated cells or coagulated in the sap.

The rôle of glycerin in causing anomalous structures in Pisum sativum, J. LAURENT (*Bul. Soc. Bot. France, 60 (1913), No. 7, pp. 593–601, pls. 3*).—The author describes certain anomalous structures of peas grown in culture solutions to which glycerin was added. In studying peas grown in such solutions it is said to be difficult to recognize asparagin, as that substance is transformed into albuminoid material as rapidly as formed. With plants having a less abundant nitrogen reserve than the Leguminosæ, and grown in cultures containing glycerin and asparagin or glycerin and peptone, these substances offer material for the synthesis of albuminoids, and some not only favor growth, but often produce a multiplication of cells and other unforseen anomalies.

The spur shoot of the pines, R. B. THOMSON (*Bot. Gaz., 57 (1914), No. 5, pp. 362–385, pls. 4, figs. 2*).—Giving an account of studies by himself as well as some views held by other authors on the deciduous spur shoot of the genus Pinus, the author considers the facts as noted on a study of both fossil and living pines as practically conclusive evidence regarding the specialized character of this structure. The spur, as it stands to-day, is considered a special-

ized branch which is of limited growth and bears a limited number of specialized and cyclically arranged leaves, its progenitor probably having been an ordinary branch.

A bibliography is appended.

On the relationship between the number of ovules formed and the number of seeds developing in Cercis, J. A. HARRIS (*Bul. Torrey Bot. Club, 41 (1914), No. 4, pp. 243–256, figs. 3*).—Continuing the plan of treatment outlined in a paper previously noted (E. S. R., 29, p. 829) but employing in the later studies *Cercis canadensis*, the author gives the results of studies carried out with nearly 35,000 pods. The results are indicated in tabular and graphical form. It is stated that the correlations for number of ovules formed and number of seeds developed per pod were found to be positive and of a moderate, considerable, or high degree of intensity.

Reversion in prickly pears, D. GRIFFITHS (*Jour. Heredity, 5 (1914), No. 5, pp. 222–225, figs. 2*).—This is a brief account of a supposedly spineless Opuntia from the island of Malta, which, since being planted at Chico, Cal., has developed spines on a part of the plant, also on plants developed from that part. This is thought to be possibly a case of reversion showing that the original ancestor of the Opuntias was spiny.

The probable origin of Œnothera lamarckiana, H. DE VRIES (*Bot. Gaz., 57 (1914), No. 5, pp. 345–361, pls. 3*).—Summing up the results of this historical investigation, the author states that *Œ. lamarckiana*, as represented by specimens studied a century or more ago and still preserved, remains entirely unchanged at the present time, being now a well established component of the flora of the eastern United States and of England. It is thought that the strain which is now in cultivation, having been introduced into the trade about 1850, was probably derived from some wild English stock which may itself have come from the introduction into Europe of seeds collected by some botanists of the earlier period of study referred to.

An analytical and phytogeographical study of Leguminosæ, L. CAPITAINE (*Étude Analytique et Phytogéographique du Groupe des Légumineuses. Paris, 1912, pp. 500, pls. 24*).—The author presents analytical keys to the tribes and genera of leguminous plants, after which the geographic distribution of the species is discussed at length.

The seed of the Leguminosæ, L. CAPITAINE (*Les Graines des Légumineuses. Paris, 1912, pp. XII+455, pls. 26, figs. 692*).—The results are given of a study of the external morphological characters of seeds of a large number of species of leguminous plants. The author claims that the seeds of leguminous plants have characteristics by which the species may be generally recognized, and that numerous characters of convergence indicate adaptations which should be considered in a study of the seed and of the geographic distribution of the species producing it.

The culture of Leguminosæ with particular reference to nitrogen assimilation, B. HEINZE (*Jahresber. Ver. Angew. Bot., 10 (1912), pp. 75–114*).—Reporting a continuation of work previously noted (E. S. R., 26, p. 37), the author shows that serradella on ground previously used for clover showed a distinct gain in green and in dry weight, also in percentage of nitrogen, after being inoculated with bacteria from soil in which serradella had been grown. Both lupines and serradella on land previously used for the latter gave a greater increase of nitrogen content than did either after potatoes, oats, peas, or vetches. The effects of several cultures offered on the market are also discussed.

FIELD CROPS.

[Field crop experiments] (*Rpt. Dept. Agr. Barbados, 1912–13, pp. 2–27*).—This reports and discusses results of manurial and variety tests with sugar cane and cotton, variety tests with cassava, caladiums, various legumes, and yams, and cultural trials with sour grass, guinea grass, and *Andropogon annulatus*.

The results of 20 years' experimenting with barnyard manure, superphosphate of lime, sulphate of potash, sulphate of ammonia, nitrate of soda, and dried blood have shown that the highest yields obtained with sugar cane were when 60 lbs. of nitrogen as dried blood was applied, 15 lbs. in January and 45 lbs. in June, in addition to other fertilizers. The best monetary results, however, were obtained when 40 lbs. of nitrogen as sulphate of ammonia was applied, 15 lbs. in January and 25 lbs. in June.

The addition of phosphatic manures showed losses. The best results obtained by the addition of potash were where 80 lbs. as sulphate of potash was applied in January.

Experiments with calcium cyanamid, H. Lipschütz (*Illus. Landw. Ztg., 34 (1914), No. 25, p. 247, figs. 6*).—This article gives results of experiments in various localities in which calcium cyanamid, used at rates varying from about 100 to 125 kg. per hectare and applied as a top dressing to oats, potatoes, stock beets, and cabbage, not only destroyed the wild mustard growing in the crop but increased the yields materially.

The application of nodule bacteria for legumes, G. Köck (*Monatsh. Landw., 7 (1914), No. 1–2, pp. 24–27, fig. 1*).—It is here noted that soil condition is an important factor for successful inoculation. The results obtained with lupines and serradella showed the method of inoculation with nodule bacteria to be entirely satisfactory and productive of results equivalent to those with pure culture preparations.

Some minor farm crops, J. V. Eyre, A. W. Ashby, G. F. Whitmore, and A. J. Brandon (*Jour. Roy. Agr. Soc. England, 74 (1913), pp. 127–172*).—This article discusses the general cultural and industrial conditions, and gives statistics in regard to flax, hemp, tobacco, teasels, and the production of seed of farm roots, vegetables, flowers, cereals, and grass.

Seeding grass with or without a nurse crop, A. Rindell (*Finska Moorkultur För., 1913, pp. 241–255; abs. in Zentbl. Agr. Chem., 43 (1914), No. 3, pp. 176–177*).—The results here reported of several trials from 1906–1909 show heavier yields of hay obtained without a nurse crop of oats than with such a crop.

Investigations on the influence of water on the yield of meadows and pastures, Luedecke (*Kulturtechniker, 17 (1914), Nos. 1, pp. 23–37, pl. 1; 2, pp. 101–121, pls. 7*).—Some observations on recent investigations relating to the influence of water upon the development of grass and forage plants are given.

Phosphorus-containing substances in meadow hay, M. C. Duserre et al. (*Arch. Sci. Phys. et Nat. [Geneva], 36 (1913), No. 12, pp. 578–581; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 3, pp. 350, 351*).—In this study the quantity of (1) phosphatids, (2) phosphates, and (3) nucleo-proteids in various samples of hay is given. The application of phosphatic manures seems, from the data given, to have increased the phosphorus content of the hay, more especially that part present in the form of phosphates and phytin.

The composition of alfalfa, P. Lavenir (*Bol. Min. Agr. [Buenos Aires], 16 (1913), Nos. 5–6, pp. 581–596*).—Results of analyses of several hundred samples of alfalfa from numerous localities in Argentina are given and discussed.

A many-eared variety of maize obtained by selection in Hungary, E. GRABNER (*Gaz. Lapok, No. 51 (1913), p. 850; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 3, pp. 352–354*).—As high as 12 ears are noted as being secured on a single stalk, but there seemed to be no regularity in the transmission of this character.

Cultural experiment with American and African horse-tooth corn, WACKER (*Fühling's Landw. Ztg., 63 (1914), No. 3, pp. 73–75*).—In comparative tests between Virginia and Natal corn, grown at Hohenheim, Germany, in 1912, the American corn made the best growth, as has also been noted in results of earlier tests (E. S. R., 28, p. 534).

Acidity as a factor in determining the degree of soundness of corn, H. J. BESLEY and G. H. BASTON (*U. S. Dept. Agr. Bul. 102 (1914), pp. 45, pl. 1, figs. 33*).—This bulletin describes the acid test (E. S. R., 24, p. 409) and shows how it may be used in the commercial grading of corn, and states the following facts that have been established by the corn acidity investigations:

"All corn, unless in a state of putrefaction, contains acid-reacting substances which impart to the corn a certain degree of acidity. There is a great variation in the degree of acidity of corn, ranging from 9 to 10 cc. to over 100 cc. The degree of acidity can be determined by the acid test to within 0.5 cc. The source of corn acidity is mostly in the germ. The source of increase in the degree of acidity is almost entirely in the germ. All corn judged damaged by the eye is higher in degree of acidity than corn judged sound by the eye. In a general way the degree of acidity of corn varies inversely with the germinative power. The degree of acidity of corn increases directly with the percentage of damaged kernels as determined by mechanical analyses. The degree of acidity of corn is greatly increased by the action of fermentation and high temperature. Throughout the year, from harvest to harvest, there is a gradual increase in the degree of acidity and a corresponding decrease in the percentage of germination of corn arriving at terminal markets.

"With respect to quality and soundness, the degree of acidity of corn is commensurate with the commercial grading at terminal markets. The degree of acidity of corn is a criterion of soundness and quality. From the standpoint of commercial grading, corn with a degree of acidity less than 22 cc. is normally sound and of good commercial quailty; corn with a degree of acidity between 22 and 26 cc. is somewhat inferior in quality and soundness, due to deterioration of the germ; corn with a degree of acidity between 26 and 30 cc. evidences marked deterioration and is unsound, and corn with a degree of acidity greater than 30 cc. is badly damaged and should be considered from a commercial standpoint as sample-grade corn."

A preliminary report of this work has already been noted (E. S. R., 30, p. 734).

Cotton, H. HEIZMANN (*Die Baumwolle. Zurich and Leipsic, 1913 vol. 1, pp. VIII+355*).—A treatise, of which this volume seems to be the first part, covering the cultural, ancient and modern history, and industrial aspects of cotton.

Experimental work with cotton, W. ROBSON (*Imp. Dept. Agr. West Indies, Rpts. Bot. Sta. Montserrat, 1912–13, pp. 2–7*).—This paper reports results of variety tests and of hybridization. In crossing native Montserrat cotton with Sea Island varieties a type was obtained that in the F_2 generation yielded lint ranging from 35 to 50 mm. in length.

Mutation in Egyptian cotton, T. H. KEARNEY (*U. S. Dept. Agr., Jour. Agr. Research, 2 (1914), No. 4, pp. 287–302, pls. 9*).—In this article the author discusses the origin of the Egyptian varieties, origin of new varieties in Arizona, mutability of Egyptian cotton, and the theories of mutations of De Vries, Heribert-Nilsson, and others. The varieties Yuma, Pima, and Gila are

described, and their origin as mutations from the Egyptian variety Mit Afifi is noted.

Plant breeding work in Arizona, which began 12 years ago with imported seed of the Mit Afifi variety, has through "persistent selection of the best plants caused some improvement in earliness and productiveness and in the quality of the fiber, but the progress was not very substantial prior to 1908, in which year two types very different from the Mit Afifi were recognized and isolated."

"If the tendency to produce mutants is a result of remote or complex hybridization, the mutability of Egyptian cotton might be accounted for upon either of the following grounds: (1) The supposed hybrid origin of the type as a whole, or (2) later crossing with other types of cotton. Ever since mutation became recognized as a factor in the breeding of Egyptian cotton the following methods have been followed in Arizona: (1) Recognition and isolation of desirable mutants; (2) selection and comparison on the progeny-row basis of those individuals among their progeny which express most fully the desirable characters of the new type; (3) elimination from the seed-increase fields, preferably before blossoming begins, of the aberrant and otherwise undesirable individuals."

A bibliography of 21 titles is appended.

The deterioration of Egyptian cotton, K. SNELL (*Jahresber. Ver. Angew. Bot., 11 (1913), pt. 1, pp. 9–13*).—Methods of cultivation and crossing with the Hindu cotton are given as causes for the deterioration noted.

Studies in Indian cottons.—I, The vegetative characters, H. M. LEAKE and R. PRASAD (*Mem. Dept. Agr. India, Bot. Ser., 6 (1914), No. 4, pp. 115–141, pls. 22*).—This discusses studies on the vegetative characters of Indian cotton, and includes monopodial and sympodial types, pollination, color of the corolla, eye of the petal, red coloring matter in the sap, leaf factor, type of branching, and length of vegetative period in their relation to field culture and commercial value of the crop. Many of the data are reported in tabular form.

Fibers from various sources (*Bul. Imp. Inst. [So. Kensington], 12 (1914), No. 1, pp. 32–45*).—Results of tests are reported of fibers of jute, *Malachra capitata*, *Urena lobata*, Sida, Rama, sisal, aloe, and "Crowa" from India, Nigeria, Federated Malay States, Bechuanaland, and British Guiana, and of paper-making material made from the Nipa palm and *Scilla rigidifolia* from the Federated Malay States and South Africa.

Experiments in Hungary with hemp seed from Asia Minor and from Italy, K. GASZNER (*Közlek [Budapest], 24 (1914), No. 4, p. 84; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 3, p. 360*).—This notes the superiority of Asiatic hemp over Italian in yield and length in a 3-year test.

Sexual inequality in hemp, O. F. COOK (*Jour. Heredity, 5 (1914), No. 5, pp. 203–206, figs. 2*).—This notes the appearance at the Virginia Truck Station near Norfolk of a great inequality in oil-seed hemp plants. The male plants die while the females grow vigorously under the same conditions.

"Another peculiarity of the oil-seed hemp is that the lateral fruit-bearing branches have extremely short internodes, analogous to those of the so-called cluster varieties of cotton. The shortening of the fruiting branches may also be connected with the earliness and productiveness of the crop, from which high yields of seed are obtained."

Investigations on hops, J. SCHMIDT (*Compt. Rend. Lab. Carlsberg, 10 (1913), Nos. 2, pp. 233–251, figs. 4; 3, pp. 267–283, pls. 2, figs. 2; abs. in Nature [London], 93 (1914), No. 2321, pp. 199, 200*).—This paper consists of two parts.

Part 1 gives results of a study, continued during 1911–12, to ascertain "if the improved sorts of cultivated hops from southern regions have a different rate of growth in our northern climate from our wild-growing plants, which possibly are better suited to the climate."

Measurements of the hop stems were also taken at 6-hour periods for several days, and it was "found that the growth in length of hop stems under natural conditions has a very distinct diurnal period, the rate of growth being smallest during the night, greatest during the day. This periodicity is determined by outer factors, among which the temperature has such a predominant influence that under natural conditions it determines the rate of growth."

Part 2 gives the results of observations made in 1913 by which it is shown that "in experiments with vigorous 3-year-old hop plants, which were firmly rooted in an open glass (cold) house, the stems were found to show during May and June a rotational movement amounting on an average for 1 to 2 weeks' observations to about 120° per hour or one-third of the rate of the minute hand of the clock.

"On closer study the rotational movement proved, like the growth in length, to have a very distinct daily periodicity, the rate being greatest during the day, least at night. Further, the experiments showed that this daily periodicity is determined by external factors, among which the temperature is of such dominating importance that its variation under natural conditions is determinative for the rate of rotation. A graphic comparison of the fluctuations in the rate of rotation and degree of humidity shows that there is no connection between them under the natural conditions prevailing when the observations were carried out.

"From laboratory experiments in June with pot plants, which were placed alternately in the light and dark, under otherwise uniform external conditions as far as possible, it appeared that the rotational movement is not different, at any rate not essentially different, in the dark and in scattered daylight. Experiments carried out in a cellar with constant low temperature showed that the minimum temperature for the rotational movement, just as for the growth in length, lies in the neighborhood of 4°.

"An endeavor has been made with the minimum temperature as starting point to obtain an expression of the relative quantities of heat which were of importance for the rate of rotation under the main experiment. The numbers obtained, which are called 'active quantities of heat', show that there is a very complete agreement between fluctuations in these and in the rate of rotation, the fluctuations showing a perfect synchronization under the conditions observed.

"A comparative experiment with twining bean plants showed that quite a similar daily periodicity in the growth in length and rate of rotation of the stem can also be seen in them and is also determined here by the temperature. It is probable that the growth movements in many plants living under climatic conditions such as ours, where great temperature fluctuations occur in a diurnal period, have a diurnal periodicity which follows that of the temperature."

Fertilizer experiments by the German Hop Culture Association with phonolite meal and 40 per cent potash salt in 1913, F. Wagner (*Prakt. Bl. Pflanzenbau u. Schutz, n. ser., 12 (1914, Nos. 1, pp. 9–12; 2, pp. 22, 23*).—This paper reports a continuation of work previously noted (E. S. R., 30, p. 527), and gives results that show superiority of the potash salt over phonolite meal, both by direct application and in its after effect.

Tests of selections from hybrids and commercial varieties of oats, C. W. Warburton, L. C. Burnett, and H. H. Love (*U. S. Dept. Agr. Bul. 99 (1914), pp. 25, figs. 6*).—Results of comparative yield tests are reported between numer-

ous pure-line selections from commercial varieties of oats and hybrids secured in crossing some of these pure-line selections, under the various climatic and soil conditions found at McLean, Ill., the Iowa, New York Cornell, Pennsylvania, Virginia, Ohio, Indiana, Kentucky, Tennessee, and Minnesota experiment stations, and the Arlington, Va., Experimental Farm.

The system of numbering and methods of testing and of making the selections are described. From these results it seems that hybrids resulting from the use of varieties Welcome, Sixty-Day, Probsteier, Burt, Danish Island, Asia Minor Rustproof, and Silvermine have proved among the most valuable, but none of the hybrids yielded persistently higher than the pure-line selections at any location.

It is noted that at Cornell Station, and similarly at other places, "the variation in results and in the relative yields of the different strains from year to year has been considerable. This is well shown by the yields of the best ten hybrids and selections for each year. In certain years the earlier strains represented by the Burt and Sixty-Day types are the best yielders, while in other years the later types represented by the Silvermine or Welcome yield best. This place variation operates to make one-year varietal tests inconclusive, [as] unusual conditions affecting the results may arise in any season."

Nitrogenous fertilizers with spring oats, J. B. MARTIN (*Vie Agr. et Rurale, 3 (1914), No. 21, pp. 575–577*).—More satisfactory results are reported in several experiments by the use of 160 kg. nitrate of soda, one-half applied at seeding time and one-half 15 days later, than with 120 kg. sulphate of ammonia, 60 kg. sulphate of ammonia and 80 kg. nitrate of soda, or 160 kg. nitrate of soda in one application.

Influence of nitrates on the germinative period of oats, F. PLATE (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 23 (1914), I, Nos. 3, pp. 161–164; 7, pp. 506–512*).—These articles continue previous work (E. S. R., 31, p. 231), in which the nitrates of many cations were used, in water solutions of varying concentrations, to fertilize the germinating seeds. The influence of these cations is discussed and results given in terms of weight of entire seedlings, length of radicle, and length of culm.

Aluminum seemed to act favorably on the young plants, tin and lead with an increase of dilution, while cerium and thorium caused the plants to die.

Chromium and manganese had a similar and depressing effect on the growth. Nitrate of uranium killed all of the plants. Iron, cobalt, and nickel nitrates gave negative results. The development correlation of other nitrates is given as follows: Rb> Sr> K> Ca> Na> Li> Mg> [Mn> Cr] > Zn> Al

Information on peanuts, A. C. TONNELIER (*Bol. Min. Agr. [Buenos Aires], 16 (1913), No. 5–6, pp. 636–641, fig. 1*).—This paper continues work previously noted (E. S. R., 31, p. 231), and notes further the advantage of shelling the peanuts before planting as a means of reducing the cost of seeding without a proportional reduction in yield. Chemical analyses are included.

Varieties of potatoes, A. C. TONNELIER (*Variedades de Papas. Buenos Aires: Min. Agr., 1913, pp. 147, figs. 155*).—This article gives cultural notes and methods used for several hundred varieties of potatoes studied experimentally at Córdoba from 1910–1912.

Potato growing in New York State (*N. Y. Dept. Agr. Bul. 57 (1914), pp. 1051–1173, figs. 43*).—This bulletin consists of 18 papers by different authors, touching upon the history, cultural methods, breeding methods, diseases and insect enemies, marketing, and food value of the potato.

Crosses between summer rape and turnip, E. BAUR (*Jahresber. Ver. Angew. Bot., 11 (1913), pt. 1, pp. 117, 118*).—It is noted that the F_1 generation of this

cross was similar and intermediate between the parents, while the F_2 generation was composed of individuals of every degree of characteristics between the original parents.

On the physiology of germination of Oryza sativa, M. Akèmine (*Fühling's Landw. Ztg., 63 (1914), No. 3, pp. 78–93*).—From the results of experiments conducted at Sapporo, Japan, since 1909, the author announces the following conclusions in regard to the germination of rice:

The maximum, optimum, and minimum germinating temperatures are 40°, 30 to 35°, and 10 to 13° C., respectively. Light had no influence, light rays of different refrangibility having the same value. Rice seed germinated as well in water as in air, whether hulled or unhulled, or whether or not the water had the oxygen expelled by boiling. The plumule, radicle, and crown roots appeared quicker when the seed was germinated in air than when germinated in water. The elongation of the plumule proceeded more rapidly in water than in air, while the reverse was true for the radicle and crown roots. Frequently changing the water and the depth of water over the seeds within the limits of 3 to 20 cm. had no influence upon hastening the germination of the seeds. The most favorable degree of moisture for the seed ranged from 60 to 95 per cent of the water-holding power of the germinating medium. Rice kernels absorb 25 to 30 per cent of their air-dry weight of water, but may be brought to germination after they have taken up 25 per cent of their air-dry weight. The loss in weight of the unhulled seed during the swelling period of 20 days, with the temperature ranging from 10 to 15°, was 1.5 per cent of their weight.

New varieties of rice from Japan, P. Poli (*Gior. Risicolt., 4 (1914), Nos. 6, pp. 82–87, figs. 8; 7, pp. 100–102, figs. 4*).—These articles describe six varieties of rice imported into Italy in 1913.

Rice cultivation and milling in Burma, M. K. Moorhead (*Daily Cons. and Trade Rpts. [U. S.], 17 (1914), No. 109, pp. 768–774*).—Industrial conditions and methods of cultivation, including implements used and values of rice in several Provinces of Burma, are described.

Nitrogenous fertilizer for rye, V. Rygula (*Ztschr. Landw. Kammer Schlesien, 18 (1914), No. 15, pp. 686–688, figs. 2*).—This gives results of experiments which indicate that rye following oats requires a nitrogenous fertilizer, that part may be applied in the fall in the form of sulphate of ammonia, and that the spring application may either be nitrate of soda or sulphate of ammonia.

Tubers of Solanum commersonii, L. Wittmack (*Jahresber. Ver. Angew. Bot., 11 (1913), pt. 1, p. 119*).—This notes a tuber about 5 by 6 cm. produced on a plant of *S. commersonii*, and also an aerial tuber on the ordinary potato plant.

Analyses of soy beans from Tonkin (*Agron. Colon., 1 (1913), No. 9, p. 87*).—Analyses of two new white varieties of soy beans show a range in fat content from 16.4 to 18.42 per cent and in protein from 38.1 to 42.5 per cent.

Variability in chemical composition of the offspring of a single mother beet in the first generation, K. Andrlík and J. Urban (*Ztschr. Zuckerindus. Böhmen, 38 (1914), No. 7–8, pp. 339–355, figs. 7*).—This reports results of analyses of about 100 representative individual plants taken from a plat that had been planted to seeds of a single mother beet in order to determine the ranges of variability in the composition of individuals of a single generation.

The range of sugar content was from 15 to 18.55 per cent. The ranges of variability of the different determinations, in terms of the average content, are given as follows: Of dry matter in the roots 33.4 per cent, dry matter in the tops 71.9, ash in the roots 64.7, ash in the tops 81.8, nitrogen in the roots 88.2, nitrogen in the tops 67.1, green weight of the roots 193, green weight of the tops 189 per cent, and sugar content 28.5 per cent.

Work at the several fields of the experiment stations for the Java sugar industry, 1912, J. SCHUIT (*Meded. Proefstat. Java-Suikerindus., 4 (1914), No. 20, pp. 317–412; Arch. Suikerindus. Nederland. Indië, 22 (1914), No. 7, pp. 213–308*).—Results are here given in tabular form and discussed regarding yields and soil analyses of about 100 experimental fields.

Experiments in thinning out sugar cane rows, A. H. ROSENFELD (*Internat. Sugar Jour., 16 (1914), No. 185, pp. 220, 221*).—Data obtained from thinned and unthinned plats of sugar cane show that there was nothing gained by thinning sugar cane, for it is stated that a "considerable amount of cane is lost, apart altogether from the expenses of the thinning operations themselves. From the very slight difference in the average weight per stalk in the two lots, it will be seen that in the first year at least the thinning out has not increased the size of the stalks left growing. Fifty kg. more cane per row were obtained from the lot not thinned out; that is, a difference in favor of this lot of more than 3 tons per hectare. This difference is slight in itself, but it certainly serves to indicate that it is not advantageous to thin out the rows."

The shipment of seed cane specimens, J. A. HALL, JR. (*La. Planter, 50 (1913), No. 23, p. 366, fig. 1*).—This article notes a method of shipping seed cane in tin cans 18 in. long by 3 in. in diameter, in which the pieces of cane are packed in loose, dampened charcoal.

A rational system of payment for cane, L. G. CAMP (*La. Planter, 50 (1913), No. 23, pp. 363, 364, fig. 1*).—This article describes and discusses methods by which the producer in Cuba and other parts of the West Indies is generally paid for the sugar value of his cane on the basis of the average selling price of sugar during the fortnight in which the cane was delivered. In Cuba the average is about 6 per cent in sugar on the weight of cane.

Tobacco growing in Ireland (*Dept. Agr. and Tech. Instr. Ireland Jour., 14 (1914), No. 2, pp. 320–337; abs. in Jour. Bd. Agr. [London], 21 (1914), No. 1, p. 58*).—Results of experiments embracing 108 acres, by 20 growers, showed the cost of pipe tobacco to be 10.9d. (22 cts.) per pound and £27 1s. ($131.64) per acre, and of cigarette tobacco 11.2d per pound and £40 5s. 2d. per acre.

A Ruakura experiment, P. MCCONNELL (*Jour. Agr. [New Zeal.], 7 (1913), No. 3, pp. 252–259, figs. 3*).—In a fertilizer experiment with Swedish turnips it is noted that in general phosphatic manures showed better results than any other fertilizer, but in conjunction with kainit lower yields were obtained than when superphosphate was used alone. "This may to some extent be accounted for by the fact that when the seeds and manures were sown there was not sufficient moisture in the soil to dissolve the injurious salts in the kainit, resulting in an injury to the germination; and it is a well-known fact that potassic manures are better applied some time previous to the sowing of the seed. It will also be noticed that the basic superphosphate and sulphur and the basic slag and sulphur plats have given a greater yield than the basic slag and kainit or basic slag and basic superphosphate plats. The addition of sulphur has, however, considerably increased the cost, and it seems strange that sulphur should be so dear in a country where it is so plentiful."

On the physiology of germination in connection with internal factors in wheat, H. NILSSON-EHLE (*Ztschr. Pflanzenzücht., 2 (1914), No. 2, pp. 153–187, pl. 1*).—Based upon the assumption that the red and white color factors of the wheat kernels were coupled with the germinative resistance of new wheat, the author announces the following conclusions from results of several years of experimenting:

The ability of a wheat to germinate quickly or slowly after maturity (germination resistance to weather conditions) was found to be a variety characteristic, segregating in the customary manner in hybrids. This physiological

character is determined by other internal factors which are essentially independent of the physiological characters hardiness and earliness, as shown in comparisons of different varieties and lines as well as in hybrid segregations. It is deemed possible to combine to a greater or lesser degree the germination resistance with hardiness and earliness.

The relative differences in the germinating conditions of wheat varieties are qualified by several internal inherited factors. Among these inherited factors the red factor, which produces the red color of the seed coat, plays a greater part than the inhibiting factor during the early stage after maturity. The white varieties, which do not contain the red factor, germinate easiest, the single red factor variety next, and the many-factored red variety the slowest. The specific germinative conditions of different varieties will be only partly influenced by the red factors, other internal factors also operating. At the same time the seed maturity and the specific seed maturation period of different varieties are essentially independent of the red factor and of other internal factors; the red factors work, however, as the inhibiting factors in the same direction as does faulty seed maturity.

The determined facts elucidate, from a new viewpoint, the important germinative physiological rôle which the seed coat plays, especially the cork layer in which the influence of the red factors is localized. The white- and single-factor red variety investigated showed somewhat more rapid absorption of water than did the multi-factored red variety. The germination inhibiting effect of the red factors is traceable, in part at least, to the fact that these factors not only influence the color, but also the structure of the seed coat.

The claim that the true seed coat of the ripe wheat kernel consists of only two cell layers, to the inner of which the integument belongs, is held to be in error. The author states that the seed coat always consists of two completely free skins, insoluble in concentrated sulphuric acid. Each of these in the red variety consists of two cell layers, and in the white variety the inner one in mature kernels is entirely structureless.

A bibliography of 32 titles is attached.

A case of repulsion in wheat, F. L. Englebow (*Proc. Cambridge Phil. Soc., 17 (1914), No. 5, pp. 433–435*).—Results are here given of a cross between Smooth Black and Rough Chaff wheat. The 213 plants of F_2 generation segregated rough black 120, rough white 43, smooth black 47, and smooth white 3, which corresponded closely with the theoretical expectation of 109.8 : 49.9 : 49.9 : 3.3. The application of methods of determining the best coupling and repulsion series for these observations are discussed.

Studies on the stems of wheat, L. Blaringhem and E. Miège (*Compt. Rend. Acad. Sci. [Paris], 157 (1913), No. 25, pp. 1457–1460*).—This notes some results in crossing pure lines of *Triticum vulgare*, *T. dicoccum*, and *T. turgidum* which, the author states, indicate the mosaic in the anatomical characters.

On the production of hybrids between wild and cultivated wheats, Blaringhem (*Compt. Rend. Acad. Sci. [Paris], 158 (1914), No. 5, pp. 346–349, fig. 1*).—The author notes in the results of this cross the dominance of flinty albumin and triangular shape to amylaceous albumin and rounded shape and wrinkled.

Increase of the productivity of Hungarian wheat by means of selection, E. Grabner (*Köztelek [Budapest], 23 (1913), No. 99, pp. 3331–3333; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 3, p. 352*).—This notes the improvement of some Hungarian wheats by selection to increase the number of kernels per spikelet.

Characters of the grain in varieties of Hungarian pedigree wheat and their hereditary transmission, E. Obermayer (*Köztelek [Budapest], 23 (1913),*

No. 93, pp. 3133, 3134; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 3, pp. 351, 352).—It is noted that the selected forms of Hungarian wheat from the same variety differ not only in their development and in the morphological peculiarities of the plants, but also in the character of the kernels, and that these characters breed true.

Seeding wheat in Oklahoma, A. H. WRIGHT (*Oklahoma Sta. Circ. 32 (1914), pp. 3–8*).—Cultural methods are here described for producing wheat under Oklahoma conditions.

Results of seed inspection, 1913, J. P. HELYAR (*New Jersey Stas. Bul. 266 (1914), pp. 3–39*).—This bulletin gives results of the inspection of seeds for 1913, with comments and some directions for sampling and sending samples of seeds to be inspected, and gives the text of the New Jersey seed law.

Combating weeds, with special reference to calcium cyanamid and kainit, OPITZ (*Ztschr. Landw. Kammer Schlesien, 18 (1914), No. 14, pp. 617–622*).—Results here noted show iron sulphate, sulphuric acid solution, and some proprietary preparations to have been satisfactory. Those obtained with calcium cyanamid and kainit, used at the rate of 100 and 600 kg. per hectare, respectively, were unsatisfactory.

Weeds, R. H. BIFFEN (*Jour. Roy. Agr. Soc. England, 74 (1913), pp. 376–379*).—Notes on and methods of eradication of the following weeds are here presented: *Spergula arvensis, Polygonum persicaria, Orobanche minor*, and dodder.

HORTICULTURE.

Manual of horticulture, G. BASSOTTI (*Vademecum do Horticultor. Sao Paulo, Brazil, 1913, pp. XII+556, figs. 267*).—Part 1 of this manual deals with the general principles of horticulture. Part 2 takes up in alphabetical arrangement the botany, culture, and uses of all of the more important vegetables, pot herbs, etc. A similar brief treatment of the pineapple is appended.

Everyman's garden every week, C. A. SELDEN (*New York, 1914, pp. XIV+338*).—A popular treatise on kitchen and ornamental gardening. Aside from the general considerations relative to preparation of the soil, fertilizing, protection against pests, etc., the chapters of the book are placed in chronological order with reference to the various garden operations for the year. These operations are arranged for the most part under the weeks in which they best may be done.

The gardener's pocket manual, F. F. ROCKWELL (*New York, 1914, pp. 90, figs. 33*).—A manual of information and data covering various operations in connection with the flower garden, the vegetable garden, and the home grounds in general.

The carbon nutrition of horticultural plants, H. FISCHER (*Gartenflora, 63 (1914), No. 6, pp. 125–132*).—In continuation of previous investigations relative to the value of carbonic acid gas as a plant nutrient (E. S. R., 28, p. 837), the author here describes experiments conducted in a greenhouse with various horticultural plants. Although working conditions were at times unfavorable, the results as a whole tend to confirm the author's previous conclusion that the development of both foliage and flowers is stimulated by an excess of carbonic acid in the air. The yield of tomatoes was practically doubled by the carbonic acid treatment, and the yield of cucumbers was increased about 12.5 per cent. In the case of treated and untreated cuttings of fuchsia plants, practically no difference was noted in the time of rooting, but the treated plants came into bloom quicker, and the blooming period was prolonged for several weeks. A number of other plans gave more or less successful results when grown with an excess of carbonic acid in the air.

The general conclusion is reached that the question of carbon nutrition is of great importance in plant culture and should be widely investigated. From his investigations as a whole, the author is of the opinion that the increased flower development under carbonic acid treatment is due to a certain excess of carbohydrates over the soil nutrients. The fact that 0.03 per cent of carbonic acid has usually been considered as sufficient for plant growth is attributed to the failure to conduct investigations in the presence of a sufficient amount of light for the greater utilization of carbonic acid.

Another hypothesis to account for Dr. Swingle's experiments with citrus, A. C. and A. L. HAGEDOORN (*Amer. Nat., 48 (1914), No. 571, pp. 446–448*).—The authors advance the hypothesis that *Citrus trifoliata*, the lemon, orange, and other citrus fruits used in Swingle's cross-breeding experiments (E. S. R., 29, p. 839) are self-sterile and that the seeds, normally produced, are produced asexually with a resulting trueness to type. Likewise, although the plants secured from a first cross differ exceedingly among themselves, these new forms reproduce only their own kind because they normally produce seed asexually.

The authors have begun an experiment with squashes to find out whether it is possible that a plant impure for a number of genes produces a variable F_2 generation of only completely homozygous plants. Certain hybrid plants in which the female buds have been carefully sealed have produced no fruit; others have produced plenty of empty fruit; and still others have produced several fruits full of viable seed. These seeds are to be grown with a view to studying the F_2 generation.

Fertilizer experiments with muskmelons, J. W. LLOYD (*Illinois Sta. Bul. 155, Abs. (1912), pp. 4, figs. 2*).—A summarized account of experiments previously noted (E. S. R., 28, p. 46).

Onion culture on muck lands, C. P. HALLIGAN (*Michigan Sta. Spec. Bul. 67 (1914), pp. 3–18, figs. 12*).—A practical treatise on onion culture with special reference to muck lands. It discusses the drainage and preparation of soils, various cultural operations, harvesting, storing, and varieties.

Spray and practice outline for 1914, H. J. EUSTACE and R. H. PETTIT (*Michigan Sta. Spec. Bul. 69 (1914), pp. 24, figs. 7*).—This bulletin contains general spraying directions for the treatment of orchard and small fruits and of vegetables.

The relation of ventilation to the keeping qualities of fruits and vegetables, G. R. HILL, JR. (*Wash. Univ. [St. Louis] Studies, 1 (1913), I, No. 1, pp. 46–64*).—A report on the author's experimental studies on the respiration of fruits and growing plant tissues, the substance of which has been largely noted from another source (E. S. R., 29, p. 538). In addition to the work with fruits, the present paper contains some additional data on the keeping qualities of lettuce with good ventilation, and with no ventilation in air, in nitrogen, and in carbon dioxid.

Methods of heating commercial greenhouses, C. PYNAERT (*Jour. Soc. Nat. Hort. France, 4. ser., 15 (1914), May, pp. 336–348, pl. 1*).—A descriptive account of various greenhouse heating systems, including the results obtained the first winter from a steam plant installed in a greenhouse establishment in Ghent.

The status of fruit culture in Tunis and Algeria, L. GUILLOCHON (*Bul. Dir. Gén. Agr. Com. et Colon. Tunis, 18 (1914), Nos. 74, pp. 87–103; 76, pp. 219–241*).—This embraces the results of a general survey of the fruit industry in various parts of Tunis and Algeria.

The blooming time of fruit trees, J. P. M. CAMMAN (*Maandbl. Nederland. Pomol. Ver., 4 (1914), No. 5, pp. 94–99*).—Data for the beginning and end of the blooming period are given for numerous varieties of apples and pears growing

in the Zeeland Horticultural Gardens. The data given cover the period 1905 to 1913, inclusive.

The pollination of apples and pears, G. H. WEST (*Trans. Kans. State Hort. Soc., 32 (1912–13), pp. 38–50*).—This is largely a review of the American literature on the subject.

The influence of chemical fertilizers on the ripening time of pears, G. RIVIÈRE and G. BAILHACHE (*Jour. Soc. Nat. Hort. France, 4. ser., 15 (1914), June, pp. 435–438*).—The results of the authors' experiments with pear trees as determined for the first season indicate that a complete fertilizer may retard rather than hasten the ripening period of pears.

Olive culture in Tunis, C. CAMPBELL (*Bul. Dir. Gén. Agr. Com. et Colon. Tunis, 18 (1914), No. 78, pp. 375–388*).—A brief survey of the olive industry in Tunis with special reference to cultural conditions and types of olives grown there.

Study of the influence of various grape stocks on the quality and quantity of the harvest, H. FAES and F. PORCHET (*Terre Vaud., 6 (1914), Nos. 15, pp. 179–181, fig. 1; 16, pp. 187, 188, fig. 1; 17, pp. 197–199, fig. 1; 23, pp. 255–257, figs. 4; 24, pp. 265, 266, figs. 2; 25, pp. 275–277, fig. 1*).—In continuation of the previous report (E. S. R., 30, p. 43) data are given for 1913 relative to the adaptability of a number of pure American, American hybrid, and French-American hybrid grape stocks for the Chasselas grape.

On the cultural effects of the time of pruning grapes and their relation to the physiological effects, J. L. VIDAL (*Compt. Rend. Acad. Sci. [Paris], 158 (1914), No. 17, pp. 1192–1194*).—Pruning experiments conducted during the 3 years 1911–1913 led the author to conclude, in general, that other conditions being equal the time of pruning modifies only slightly the number of bunches of grapes which are borne.

With extreme late pruning the bunches are more vigorous and the proportion of imperfect bunches and aborted flowers is less. The individual berries are larger, heavier, and more numerous. The growth is more rapid for late pruned vines and continues for a longer time. The vegetation is at times diminished and at times increased by spring pruning just as in winter pruning. These positive or negative variations in vegetation progress or retrogress in more or less regular order with the progression of the time of pruning. The data here considered deal with pruning operations conducted at intervals from the first of January to about the middle of April. With vines pruned after the middle of February, the later the pruning the greater the retarding effect on bud swelling and the flowering season.

The cultural results here noted are attributed to a disturbance either in one direction or the other of the stored-up food supply and the recently assimilated material. This phase of the subject is here briefly discussed.

Spraying in relation to the flowering season, L. LEBRUN (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 35 (1914), No. 23, pp. 711, 712*).—Experiments and observations conducted by the author in 1913 and here briefly noted indicate that solutions of copper applied for the control of grape mildew during the blooming period are more or less injurious to the blooms and newly-set fruit and may result in a short crop. The application of copper salts in dust form during the flowering period does not appear to cause such serious results.

Strawberries, J. VERCIER (*Jour. Soc. Nat. Hort. France, 4. ser., 15 (1914), May, pp. 349–375, fig. 1*).—This comprises the results of an investigation with special reference to conditions in France relative to the influence of soil and fertilizers on the yield, chemical composition, size, and edible qualities of strawberries.

The general conclusion is reached that although strawberries will grow on various types of soils they will thrive best on a deep mellow soil, rich in iron salts. Analyses of the strawberries grown on different soils and treated with various fertilizers indicate that the fertilizer treatment should vary with the type of soil in question in order to produce the best fruit. A number of general fertilizer formulas for different types of soil are suggested.

Application of cold in the agricultural industry.—The conservation of strawberries, I. Mauro (*Agr. Mod. [Milan], 19 (1913), No. 23, pp. 270, 271, figs. 3*).—A general discussion of the application of cold storage to the preservation of agricultural products, including some data on cold storage experiments with strawberries conducted at Breganze in cooperation with A. Cogo. A bibliography of literature on the conservation of food supplies is included.

New varieties of roselle, P. J. Wester (*Philippine Agr. Rev. [English Ed.], 7 (1914), No. 6, pp. 266–269, pls. 3*).—The author here describes and names the following varieties of roselle (*Hibiscus sabdariffa*): The Temprano, which originated at the Lamao Experiment Station; the Archer, which was introduced from the British West Indies; and the Altissima, which was introduced from the Gold Coast, West Africa.

Parthenocarpy and seed formation in bananas, A. d'Angremond (*Ber. Deut. Bot. Gesell., 30 (1912), No. 10, pp. 686–691, pl. 1; Flora, n. ser., 7 (1914), No. 1, pp. 57–110, pls. 8, figs. 14*).—In the first part of this paper the author gives the principal results secured from his observations and pollination experiments with bananas conducted in Surinam from 1909–1911. The second part of the paper describes studies of fixed material conducted at the Zürich Institute for General Botany in 1911–1913. The subject matter is discussed under the following general headings: Morphological and experimental studies on the fruit formation in seed-containing and seedless bananas in Surinam; the historical and cytological development in seed-forming and seedless bananas from Surinam; and hypothesis on the origin of edible bananas. The literature dealing with parthenocarpy in fruits is briefly reviewed and a bibliography is appended.

The investigation as a whole shows in brief that our common edible bananas are naturally parthenocarpic. Their own pollen is practically sterile and the fruit is not improved by cross-pollination. In addition to practically sterile pollen, there is a more or less complete degeneration of the embryo sacks, particularly in the Jamaica variety commonly shipped to the United States.

The changes occurring in the ripening coconut, B. M. Gonzalez y Sioco (*Philippine Agr. and Forester, 3 (1914), No. 2, pp. 25–31*).—This comprises a preliminary study of the ripening coconut with reference to the changes in size, weight, and color of the nut and the chemical changes in the milk and solid endosperm.

From the data thus far secured the ripening of a coconut is divided into three periods, during the first of which there is an accumulation of invert sugar and amino acids in the milk or watery portion; the meat is still absent, the shell and husk are soft and watery, and the nut as a whole has its greatest diameter along the main axis. During the second period water is lost from the coconut though its total weight continues to increase. Sucrose appears in the milk and the specific gravity of the latter is high. During this period the nut begins to acquire its greatest diameter in a direction at right angles to the main axis. During the third period of ripening there is a sudden rise in the content of oil in the endosperm and the specific gravity of the milk falls owing to the transfer of nutrient materials or to respiration. During this period the shell becomes impervious and the drying out of the husk results in loss in weight, thus overbalancing the gain in weight due to other changes.

The macapuno coconut, B. M. GONZALEZ Y SIOCO (*Philippine Agr. and Forester, 3 (1914), No. 2, pp. 31, 32*).—A brief descriptive account is given of the macapuno, a sport fruit of the coconut which instead of containing water is nearly or quite full of a viscous, white, translucent jelly whose texture next to the shell more or less closely approaches the firmness of ordinary coconut meat. This type of fruit occurs only in small quantities on trees bearing normal coconuts. Thus far no way is known of distinguishing normal fruit from macapuno fruit, except by shaking the fruit. It has been observed, however, that the trees which bear macapuno nuts will continue to do so from year to year.

The sex of date palm seedlings (*Roy. Bot. Gard. Kew, Bul. Misc. Inform., No. 4 (1914), pp. 159–162*).—From the information thus far secured as a result of an investigation of the reputed ability of Arabs to change the sex of date palms, it is concluded that there is no authentic record of such changes ever having been made.

The jaboticaba, W. POPENOE (*Jour. Heredity, 5 (1914), No. 7, pp. 309–326, figs. 6*).—A descriptive account with illustrations is given of the jaboticaba (*Myrciaria* spp.), a grapelike tree fruit collected by the author on a recent trip of agricultural exploration in Brazil.

Cultural directions for the papaya, P. J. WESTER (*Philippine Agr. Rev. [English Ed.], 7 (1914), No. 6, pp. 251–257, pl. 1, figs. 3*).—A brief popular treatise on the propagation, culture, and care of the papaya, including notes on the rejuvenation of old plants and seed selection.

Cultural experiments with medicinal plants in Korneuburg in 1913, E. SENFT (*Ztschr. Landw. Versuchsw. Österr., 17 (1914), No. 3–4, pp. 129–182*).—Results of cultural tests of a large number of medicinal plants are reported, and some general considerations are given relative to the culture of medicinal plants in Austria.

The National Rose Society's official catalogue of roses (*Berkhamsted, England, 1914, pp. 132*).—This comprises a descriptive catalogue of roses compiled under the direction of the National Rose Society of England. In addition to the general descriptive catalogue, a descriptive list is given of the newer roses for the period of 1910 to 1913, together with lists of roses arranged according to the classes to which they belong and selections of roses for various purposes.

The practical book of garden architecture, PHEBE W. HUMPHREYS (*Philadelphia and London, 1914, pp. XV+330, pls. 83*).—A practical treatise on garden architecture, combining several of the author's articles on this subject which have appeared in different publications with considerable new matter. The work embodies many suggestions gleaned from an intimate study of beautiful home surroundings in the form of garden architecture during extensive travels in various European countries and throughout the United States. The text is fully illustrated.

Rock gardens, how to make and maintain them, L. B. MEREDITH (*New York, 1914, 2. ed., pp. XXII+390, pls. 21, figs. 6*).—In the present edition of this work (E. S. R., 26, p. 139) the list of plants suitable for rock gardening has been increased by the inclusion of desirable forms which have recently been put on the market.

Trees for street and yard planting and their care, C. A. SCOTT (*Trans. Kans. State Hort. Soc., 32 (1912–13), pp. 25–32*).—Lists are given of trees for street and yard planting in different districts of Kansas, together with suggestions dealing with the care of shade trees.

Hardy shrubs for Kansas, E. F. A. REINISCH (*Trans. Kans. State Hort. Soc., 32 (1912–13), pp. 32–35*).—The author here presents a list of some 36

kinds of trees, shrubs, and vines with ornamental fruit which have proved to be hardy and otherwise desirable for planting in Kansas.

FORESTRY.

Connecticut's forest taxation law (*Connecticut Sta. Spec. Bul. (Forestry Pub. 9), 1913, pp. 8, fig. 1*).—A special bulletin containing the text of a law providing a new plan of taxation of woodland which was enacted by the Connecticut General Assembly of 1913, and a brief discussion of its more important features.

Administration report of the forest circles in the Bombay Presidency, including Sind, for the year 1912–13 (*Admin. Rpt. Forest Circles Bombay, 1912–13, pp. 166+5*).—This is the customary report relative to the administration of the state forests in the Northern, Central, and Southern Circles of the Bombay Presidency, and of Sind, including a financial statement for the year 1912–13. All important data relative to alterations in forest areas, forest surveys, preparation of working plans, forest protection, silvicultural operations, exploitation, yields, revenues, etc., are appended in tabular form.

Annual progress report on forest administration in the Province of Bihar and Orissa for the year 1912–13, H. Carter (*Ann. Rpt. Forest Admin. Bihar and Orissa, 1912–13, pp. 6+18+XXXVII+5*).—A report similar to the above relative to the administration and management of the state forests in the Province of Bihar and Orissa for the year 1912–13.

Progress report of forest administration in the Punjab for the year 1912–13, W. Mayes (*Rpt. Forest Admin. Punjab, 1912–13, pp. 10+20+LI*).—A report similar to the above on the administration and management of the state forests in Punjab for the year 1912–13.

Observations on the edge of the forest in the Kodiak region of Alaska, R. F. Griggs (*Bul. Torrey Bot. Club., 41 (1914), No. 7, pp. 381–385, fig. 1*).—A brief study of the natural extension of the forest boundaries in the Kodiak region of Alaska.

The conversion of coppice-with-standards into high forest in France, R. S. Troup (*Quart. Jour. Forestry, 8 (1914), No. 3, pp. 208–212, pls. 3*).—A brief descriptive account of the systems employed in France in the conversion of coppice-with-standards into high forests.

On natural and artificial regeneration in the forests of north Sweden, E. Wibeck (*Meddel. Stat. Skogsförsöksanst. (Mitt. Forstl. Vers. Anst. Schwedens), No. 10 (1913), pp. 91–138, XI–XVI, figs. 13*).—Results are given of both natural and artificial regeneration studies with pine and spruce in north Sweden, including results to date of forest planting work in that region.

Three thinning areas in the Skagersholm state forest, G. Schotte (*Meddel. Stat. Skogsförsöksanst. (Mitt. Forstl. Vers. Anst. Schwedens), No. 10 (1913), pp. 181–210, XXIII–XXVII, pls. 2, figs. 13*).—Thinning experiments in mixed coniferous forests conducted under the direction of the Swedish Forestry Experiment Station are here reported.

Recent ecological investigations, H. de Forest (*Proc. Soc. Amer. Foresters, 9 (1914), No. 2, pp. 161–176*).—A brief review of some of the recent developments in ecological investigations, including a bibliography of cited literature.

The determination of site qualities for even-aged stands by means of a site factor, E. J. Hanzlik (*Proc. Soc. Amer. Foresters, 9 (1914), No. 2, pp. 229–234*).—A comparative analysis of the cubic volume and formula methods of determining site qualities for even-aged stands, as applied chiefly to Douglas fir stands in Washington and Oregon.

Yield in uneven-aged stands, B. MOORE (*Proc. Soc. Amer. Foresters, 9 (1914), No. 2, pp. 216–228*).—In this paper the author analyzes the fundamental difficulties met with in the application of existing methods of determining yields in uneven-aged stands and offers suggestions relative to new methods or modifications of already existing methods.

Determination of stocking in uneven-aged stands, W. W. ASHE (*Proc. Soc. Amer. Foresters, 9 (1914), No. 2, pp. 204–206, figs. 2*).—The author briefly describes a method of determining the proportion of stocking in uneven-aged stands. This method, it is believed, is applicable for use in connection with any species which occasionally forms pure even-aged groups.

The measurement of increment on all-aged stands, H. H. CHAPMAN (*Proc. Soc. Amer. Foresters, 9 (1914), No. 2, pp. 189–203, fig. 1*).—A similar paper by the author has been noted from another source (E. S. R., 27, p. 647).

The use of yield tables in predicting growth, E. E. CARTER (*Proc. Soc. Amer. Foresters, 9 (1914), No. 2, pp. 177–188*).—A discussion of the nature and use of yield tables as applied chiefly to pure, unthinned stands of New England white pine.

Experiments on eccentric growth of ash, SOMERVILLE and A. G. HARPER (*Quart. Jour. Forestry, 8 (1914), No. 3, pp. 218–229, pl. 1*).—The authors here report data on the eccentric growth of some 5-year-old ashes which were bent over permanently or intermittently in one or more different directions.

The hardwoods, F. W. NEGER (*Die Laubhölzer. Berlin and Leipsic, 1914, pp. 160, figs. 74*).—This comprises brief descriptions of the native trees and shrubs of central Europe, including the more important cultivated forms.

Accretion in the lower part of the stems of both pine and spruce, A. MAASS (*Meddel. Stat. Skogsförsöksanst. (Mitt. Forstl. Vers. Anst. Schwedens), No. 10 (1913), pp. 45–58, V, VI, figs. 2*).—The author here reports a statistical study of accretion in the stems of pine and spruce between the base of the tree and breast high (1.3 meters) from the ground.

In the case of pines there appears to be no definite relation between the measurement at 1.3 meters and the diameter accretion either above or below this measurement. In spruce there appears to be no definite relation between the diameter at breast height and diameters above this measurement, but there is a relation between breast-high measurements and the lower part of the trunk.

The stem height in normal pine stands, A. MAASS (*Meddel. Stat. Skogsförsöksanst. (Mitt. Forstl. Vers. Anst. Schwedens), No. 10 (1913), pp. 59–66, VII, VIII, figs. 5*).—With yield data secured from 79 pine stands in different parts of Sweden as a basis, the author has platted height and diameter curves for pine trees belonging to different locality classes.

On some transverse tests of Australian and foreign timbers, J. NANGLE (*Jour. and Proc. Roy. Soc. N. S. Wales, 47 (1913), pt. 2, pp. 165–173*).—A paper on this subject read before the Royal Society of New South Wales, October 1, 1913, in which are presented tabulated results of tests of a large number of commercial timbers. The data given show the breaking load in pounds, modulus of rupture and of elasticity in pounds per square inch, and rate of load in pounds per minute.

Fire damage in mature timber, J. A. MITCHELL (*Proc. Soc. Amer. Foresters, 9 (1914), No. 2, pp. 239–244*).—The author here presents data dealing with the susceptibility to damage and the power of recovery of various species as observed on the Klamath and Shasta National Forests during the two years 1910 and 1911.

Preservative treatment of timber for estate purposes, J. F. ANNAND (*Quart. Jour. Forestry, 8 (1914), No. 3, pp. 169–186*).—The results are given

of experiments with saponified creosote and naphthalin by the open-tank method of treating timber.

The data given are for Scots pine and spruce timber, a small quantity of unseasoned larch timber having been used for comparison. From the results thus far secured the following deductions are made:

The addition of 0.25 per cent or less of caustic soda in pure creosote improves penetration in the case of timbers which take the preservative with difficulty. Saponification of the creosote makes it possible to dilute the preservative by the addition of water and thus cheapens the creosoting process. Saponified diluted creosote may be claimed as a cheap effective substitute for the "Reuping" process of professional creosoters. Average creosote may be diluted to as much as half its full strength with good results. Naphthalin proved to be an excellent preservative and discolored the timber less than creosote. Large quantities of naphthalin are taken up by most timbers, hence its cost as a preservative is practically the same as creosote. Green timber can be treated with naphthalin quite as effectively as air-dried timber.

DISEASES OF PLANTS.

Diseases and parasites of the principal cultivated plants, A. CANEVARI (*Malattie e Parassiti delle Principali Piante Coltivate e loro Rimedii. Catania, Italy, 1913, pp. 374, figs. 101*).—Descriptions are given of the principal fungus and insect pests as well as the diseases due to malnutrition and other physiological disturbances, and where known, suggestions are offered for their control.

The diseases and injuries of cultivated plants in 1911 (*Ber. Landw. Reichsamte Innern, No. 30 (1914), pp. VIII+339, fig. 1*).—After reviewing the weather conditions in Germany in 1911 a description is given of the influence of diseases and other injuries on the yields of some of the more important crops. Following this, reviews are given of the literature relating to the more important injuries to cultivated plants and of recent publications relative to apparatus and materials used in plant protection. The publication concludes with a review of six years' work, 1906–1911, on plant protection work undertaken by the Imperial Biological Institute of Agriculture and Forestry.

[Report on plant protection in Baden, 1912], C. VON WAHL and K. MÜLLER (*Ber. Grossh. Bad. Landw. Vers. Anst. Augustenb., 1912, pp. 89, fig. 1*).—This report deals comprehensively with the diseases and insect enemies of grapes, fruits, berries, grains, tubers, forage plants, vegetables, etc., and the remedies tried or proposed. The influence of the dry hot summer season of 1911 is also discussed. Publications issued by the station or other related contributions appearing in 1912 are listed.

Division of plant pathology and mycology, I. B. P. EVANS (*Union So. Africa Dept. Agr. Rpt. 1912–13, pp. 169–183, pls. 19*).—After a brief description of the new laboratory for plant pathology and mycology, the author describes the most conspicuous diseases observed during 1912–13. Among the fungus diseases of economic importance reported from South Africa for the first time are apple tree disease (*Cytospora leucostoma*), apricot and nectarine tree disease (*Calosphæria princeps*), fescue grass ergot (*Claviceps purpurea*), lemon scab (*Cladosporium citri*), orange fruit scab (*Sporodesmium* sp.), onion scab (*Vermicularia circinans* and *Mystrosporium alliorum*), orange leaf blotch (*Phoma* sp.), peach mold (*Fusarium putaminum*), pomegranate rot (*Sterigmatocystis* sp.), potato stalk or sclerotium disease (*Sclerotinia sclerotiorum*), sugar cane diseases due to a species of Sphæronema and a species of Phoma, and a bacterial disease of tobacco similar to that known as the Granville tobacco wilt in the United States.

[Reports from Dutch East Indies on plant diseases], KNISCHEWSKY (*Ztschr. Pflanzenkrank., 23 (1913), No. 6, pp. 338–345*).—Brief notes are given regarding attacks, injuries, and diseases affecting economic plants in the Dutch East Indies, particularly tobacco, coffee, rubber, and cacao, with citations to some articles published reporting investigations thereon.

Culture experiments with rust fungi, H. KLEBAHN (*Ztschr. Pflanzenkrank., 24 (1914), No. 1, pp. 1–32, figs. 23*).—Reporting work done in 1912 and 1913 in continuance of that previously noted (E. S. R., 28, p. 242), the author deals in considerable detail with the various factors affecting viability and germination of the teleutospores and the duration of germinability by uredospores, some new hosts of *Cronartium asclepiadeum* and of *Coleosporium* spp., and some studies on *Puccinia malvacearum*.

Experiments with *Puccinia* spp. show that repeated soaking with fresh water, preferably alternating with fairly complete drying out, is a large factor in determining duration of viability in teleutospores. The air content of the water is perhaps also influential in this regard. Winter cold is thought to be neither essential nor influential as regards viability of teleutospores. Uredospores obtained early in August and later placed on germinating wheat showed a decrease of germinability with age, scarcely any germinating when sown after being kept dry for 2½ months.

Influence of the host on the morphological characters of Puccinia ellisiana and P. andropogonis, W. H. LONG (*U. S. Dept. Agr., Jour. Agr. Research, 2 (1914), No. 4, pp. 303–319*).—In continuation of a previous note on the possibility of *P. ellisiana* having its æcial stage on Pentstemon and species of Viola (E. S. R., 28, p. 551), the author has continued his investigations and presents the results of cultural data, in which numerous inoculations were made, showing that *P. ellisiana* has two widely separated æcial hosts, Viola and Pentstemon.

The infection of Pentstemon is vigorous and abundant and the characters of the fungus are completely changed after passing through Pentstemon assuming in every essential feature those belonging to the Pentstemon rust, *P. andropogonis*. The characters of the rust obtained by inoculating species of Viola with *P. andropogonis* are identical with those of the regular Viola rust. The transfer of *P. ellisiana* from Pentstemon back to the Viola is more difficult than from Viola to Pentstemon. It is believed that *P. andropogonis* may easily have originated in nature from *P. ellisiana*.

Witches' broom, E. LEMÉE (*Jour. Soc. Nat. Hort. France, 4. ser., 15 (1914), Apr., pp. 229–246, figs. 15*).—The author illustrates and describes the witches' brooms produced by the various rusts on fir trees and red currants; species of Exoascus on birch, hornbeam, cherry, pear, apple, plum, and elm; those on a number of trees caused by various insects; effect of mistletoe on junipers; and witches' brooms on junipers, spruce, and pine, due to causes unknown.

The parasitism of smut fungi, W. LANG (*Jahresber. Ver. Angew. Bot., 10 (1912), pp. 172–180*).—A brief historical discussion is followed by an account of the author's study of grain plants affected with smut in regard to the localization and mode of invasion and the vegetative life of the parasite within the host. It is stated that while mycelium arising from spores dusted on the stigma develops abundantly between cells which show lessened turgor, neighboring tissue retaining high turgidity is generally not invaded. Only in very dry seasons is the mycelium checked in development before leaving the young seed, where it enters the resting stage. The subsequent development of the parasite is described.

An extension of the studies is contemplated.

A dangerous genus (Phytophthora), A. A. L. RUTGERS (*Teysmannia, 24 (1913), No. 10, pp. 626–632*).—Discussing briefly the genus Phytophthora, the author compiles in brief form the dates of discovery of 14 species and one variety, naming hosts in connection therewith.

Investigations on the control of disease in plants, R. H. BIFFEN (*Jour. Roy. Hort. Soc. [London], 39 (1913), No. 2, pp. 313–320*).—This paper, besides giving a general discussion of plant diseases and their control, refers more particularly to the work of Biffen (E. S. R., 28, p. 147), Spinks (E. S. R., 29, p. 844), and Orton (E. S. R., 30, p. 331), dealing with immunity or susceptibility as related to manuring and to heredity.

The preparation and composition of lime-sulphur sprays, A. A. RAMSAY (*Jour. Agr. Sci. [England], 6 (1914), No. 2, pp. 194–201*).—The author reports a chemical study of lime-sulphur sprays in which an attempt was made to determine the exact composition of the material as well as the most satisfactory proportions of lime and sulphur.

From his experiments it is claimed that the ratio of lime to sulphur should be between 1:2 and 1:1.9, the exact ratio being, probably, 1:1.95. The solution of lime sulphur is said to consist of calcium hydroxyhydrosulphid, calcium thiosulphate, and calcium sulphate, with sulphur held in solution.

The preparation and use of lime-sulphur mixture, L. SAVASTANO (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 35 (1914), No. 4, pp. 109–113; R. Staz. Sper. Agrum. e Frutticol. Acireale, Bol. 2 (1912), pp. 6*).—It is claimed that a spray mixture composed of lime, sulphur, and water in the proportions by weight of **1:2:10**, prepared according to the process here recommended and described in detail, gives satisfactory results when used as either insecticide or fungicide, being relatively inexpensive in comparison with Bordeaux mixture as ordinarily employed.

Further observations on the fungicidal action of Bordeaux mixtures, B. T. P. BARKER and C. T. GIMINGHAM (*Jour. Agr. Sci. [England], 6 (1914), No. 2, pp. 220–232*).—In continuation of a previous report on Bordeaux mixture (E. S. R., 25, p. 458) the authors review their work and reply to criticisms of Pickering (E. S. R., 26, p. 853). They claim that subsequent investigations more strongly confirm their previous opinion than before.

From a study of seedlings and foliage in relation to Bordeaux mixture the authors have come to the conclusion that living cells with readily permeable walls of the unchanged cellulose type or its equivalent are able to produce and absorb soluble copper from insoluble compounds, such as the basic sulphates. The area over which a single cell can exert the solvent action is limited by the size of the cell or by the quantity of the solvent diffusing from it. Groups of cells acting together may cause action over a wider area than isolated cells acting singly. The fate of the organism is held to depend upon the relation between the amount of soluble copper produced and absorbed and the rate of growth of the organism. This is held to be a significant point in connection with practical spraying, since it explains why at times there is little check to the growth of a parasitic fungus after spraying. Cells with impermeable walls possess no power of solvent action upon insoluble copper compounds. It is held that under changed conditions cells with normally impermeable walls may become permeable and capable of action upon insoluble copper compounds. This, it is believed, will explain the difference in behavior of summer and autumn apple foliage.

Studies of mechanical frost injuries, P. SORAUER (*Ztschr. Pflanzenkrank., 24 (1914), No. 2, pp. 65–76, pls. 3*).—The author reports on further studies (E. S. R., 30, p. 541) carried out with cereals as affected by cold and parasitic fungi. Supporting conclusions by Voges (E. S. R., 29, p. 244), he states

that natural or artificial cold may produce in winter cereal plants alterations and discolorations of the membranes and vessels, which may be followed by parasitic attack in the weakened portions. Anatomical changes are described and illustrated.

Partial frost injury of winter cereals confused with animal injuries H. ZIMMERMANN (*Ztschr. Pflanzenkrank., 23 (1913), No. 6, pp. 332–334, pls. 3*).—Frost injury of winter cereals resembling in its last stages that from gnawing animals is described and illustrated. The resemblance to animal injury is completed by attacks of semiparasitic fungi, resulting in blunt abscission of the weakened portions.

Ophiobolus herpotrichus and stem rot of cereals, E. VOGES (*Ztschr. Gärungsphysiol., 3 (1913), No. 1, pp. 43–83, figs. 5*).—This is a more extended account of studies previously noted (E. S. R., 28, p. 445.)

It is stated that *O. herpotrichus* is not the specific or exclusive cause of stalk disease or foot rot of cereals (this fungus not being able to attack the plants under normal conditions), and that the disease may be found as a secondary phenomenon in association with one or more of several organisms (*Cladosporium herbarum, Mucor racemosus*, and, more particularly, *Fusarium rubiginosum*) discussed in this connection, being favored also by unseasonable weather conditions and attacks of nematodes.

Two Michigan bean diseases, J. H. MUNCIE (*Michigan Sta. Spec. Bul. 68 (1914), pp. 12, pl. 1, figs. 2*).—Popular descriptions are given of the bean anthracnose due to *Glomerella* (*Colletotrichum*) *lindemuthiana* and bean blight caused by *Bacterium phascoli*. The characteristics of these diseases are contrasted, and suggestions are given for their control.

For the anthracnose the selection of seed from pods showing no diseased spots is recommended, while for the bean blight disinfection of pods and selection will partially, though not completely, control the disease. In connection with these diseases, particularly the blight, the growing of resistant varieties is recommended.

A bacterial rot of celery, W. WORMALD (*Jour. Agr. Sci. [England], 6 (1914), No. 2, pp. 203–219, pl. 1*).—The author states that during the month of February, 1913, an examination was made of celery plants that were thought to be damaged by the parasitic fungus *Septoria petroselini apii*. Some of the plants were found to be in an advanced stage of decay, showing every evidence of a soft brown rot. An examination of the tissues showed the presence of active motile bacteria. These were isolated, and inoculation experiments showed that the organism was capable of producing the disease in question.

A technical description is given of the organism described as *Bacillus apiovorus* n. sp. It is said that little is known concerning the conditions inducing and favoring the development of the disease or of remedies for its prevention, but that proper sanitary precautions, the destruction of all decayed plants, and the holding in check of biting insects, slugs, and snails would probably aid in controlling the disease.

A brief bibliography is appended.

A fungus disease of peppers (Capsicum spp.), C. K. BANCROFF and R. L. HUNTE (*Jour. Bd. Agr. Brit. Guiana, 7 (1914), No. 3, pp. 139, 140*).—The authors report considerable injury to peppers grown in experimental tracts at the botanic gardens during 1913. The pods were affected and in a number of instances the crop was practically worthless. A study of the cause of the trouble showed that it was due to the fungus *Colletotrichum nigrum*. Some varieties, such as the Long White and Long Red, appeared very susceptible to the disease, while others were less subject to attack. Red Chili and Long Bird were unaffected.

Experiments for the control of the disease indicated that spraying with Bordeaux mixture would keep it in check.

Further observations on Phytophthora erythroseptica and on the disease produced by it in the potato plant. G. H. PETHYBRIDGE (*Sci. Proc. Roy. Dublin Soc., n. ser., 14 (1914), No. 10, pp. 179–198, pl. 1, figs. 2*).—This paper contains further observations on *P. erythroseptica* which has been previously shown to be the cause of a pink rot of the potato (E. S. R., 29, p. 550).

The author states that the reproductive organs of the fungus have been found in all of the underground parts of the plant, including in one case a tuber. Plants affected with this fungus exhibit symptoms of disease in their subaerial organs which are of the wilt type. On account of this character he suggests that the disease be known as pink rot wilt. The disease is considered contracted from the soil and is of serious consequence only in land which has been continuously in potatoes for several seasons.

Potato leaf roll. L. VON BEKE (*Jahresber. Ver. Angew. Bot., 10 (1912), pp. 145–155*).—In a brief preliminary report of studies on potato leaf roll the author states that the disorder is thought to be hereditary and infectious. The trouble does not seem usually to spread from a center. Three different forms or degrees of development are described. Field experiments continued for three years in different parts of Hungary on infected and uninfected soils showed the hereditary character of the disorder and the increase of intensity in case of infected seed tubers when planted on infected soil, plants grown from healthy seed on noninfected soil showing no trace of the trouble. Differences in violence of the attack appeared more closely related usually to weather, soil, etc., than to variety used, although two varieties used were severely attacked. The influence of soils, elevation, climate, culture, and rotation are briefly discussed.

In laboratory studies mycelium of each of four fungi, *Fusarium solani*, *F. discolor*, *F. gibbosum*, and *F. subulatum* was used, the infection being accomplished by spraying or dipping on April 29. Disease symptoms appeared late in August and on September 5 only 14 out of 120 plants tested were free from symptoms resembling those of leaf roll.

Decisive results have not yet been obtained from field tests in which the plants were sprayed with liquid containing spores, spraying with mycelium appearing to cause infection more readily.

Microscopic investigation of the tissue failed to show invariable correspondence between the disease and the presence of mycelium. The latter was more frequently noted in the lower third of the aerial portion and in the roots near the surface. It was found only once in the vascular bundles of the leaves, but commonly in the vascular bundles of the tubers near their point of attachment. Young sprouts from diseased tubers showed no mycelium.

The potato diseases of Michigan. G. H. COONS (*Michigan Sta. Spec. Bul. 66 (1914), pp. 31, figs. 13*).—Popular descriptions are given of the late blight, early blight, scab, Rhizoctonia, dry rot, wet rot, deep scab, and Fusarium wilt, all of which are reported as being present in Michigan, and in addition brief accounts are given by E. A. Bessey of the wart disease, curly dwarf disease, leaf roll, blackleg, and powdery scab, none of which have yet been reported as occurring in that State. In connection with the different diseases control measures are discussed at length.

Diseases of sugar beets. O. FALLADA (*Österr. Ungar. Ztschr. Zuckerindus. u. Landw., 43 (1914), No. 1, pp. 23–28, fig. 1*).—This is part of the 1913 report by the author on the enemies and diseases of sugar beets, and includes brief general notes on root rot, heart and dry rot, and scab, and also on some diseases affecting the leaves.

Identification of species of Fusarium occurring on the sweet potato, Ipomœa batatas, H. W. WOLLENWEBER (*U. S. Dept. Agr., Jour. Agr. Research, 2 (1914), No. 4, pp. 251–286, pls. 5*).—The author describes 13 species and varieties of Fusarium found occurring on the sweet potato, only a few of which are actively parasitic. The species and varieties described are *F. radicicola* n. sp., *F. incarnatum*, *F. culmorum*, *F. caudatum* n. sp., *F. caudatum volutum* n. var., *F. orthoceras*, *F. orthoceras triseptatum* n. var., *F. batatatis* n. sp., *F. oxysporum*, *F. hyperoxysporum* n. sp., *F. acuminatum*, *Hypomyces ipomœæ*, and *Gibberella saubinetii*.

A bibliography of cited literature is appended.

A disease resembling gummosis, J. A. HONING (*Meded. Deli-Proefstat. Medan, 7 (1913), No. 10, pp. 465–468*).—Cases are discussed in which symptoms (in particular the stripes near the leaf bases) closely conforming to those considered as characteristic of gummosis in tobacco, due to *Bacillus solanacearum*, are claimed to have been associated with an organism differing therefrom in some important characters. The stripes also are said to show on close inspection a greater breadth than those due to the bacteria which cause gummosis.

Cicinnobolus parasitic on apple mildew (Oïdium farinosum), O. OBERSTEIN (*Ztschr. Pflanzenkrank., 23 (1913), No. 7, pp. 394–396*).—The author, noting that Cicinnobolus, previously reported by him as parasitic on *Sphærotheca mors-uvæ*, has been found on oak mildew (*O. quercinum*) by Vuillemin (E. S. R., 24, p. 352), also possibly on other fungi, states that he has recently been able to confirm De Bary's listing of *Cicinnobolus* sp. as parasitic on *O. farinosum*.

Contribution to the life history and physiology of Cylindrosporium on stone fruits, B. B. HIGGINS (*Amer. Jour. Bot., 1 (1914), No. 4, pp. 145–173, pls. 4*).—This contribution, which in its present form contains a bibliography, has already been noted from another source (E. S. R., 30, p. 750).

Peach yellows investigations, H. S. REED (*Rpt. State Ent. and Plant Path. Va., 9 (1912–13), p. 20*).—A brief account is given of a cooperative experiment begun between the State Crop Pest Commission and the department of plant pathology of the Virginia Station for the purpose of making investigations on the nature and control of peach yellows. In this experiment a number of trees from the western part of the State, where the disease was very prevalent, have been planted in the eastern part of the State, where the disease is unknown. These will be kept under observation and an attempt made to discover the nature of the trouble.

Contributions on the pathology of grape stocks, J. BERNATSKY (*Jahresber. Ver. Angew. Bot., 10 (1912), pp. 31–57*).—Discussing disorders of grapevines and crops as related to climate, maturity and degree of improvement in stocks, weather and smoke, elevation and slope of land, qualities of soil and fertilizers used, cryptogamic diseases, etc., the author mentions among injurious parasites noted, Botrytis and *Dematophora glomerata*. The latter fungus thrives at temperatures above 7° C., inflicting much injury. It is found to be too deep seated to be controlled by spraying, and to require employment of such physiological factors as protection against strong sunlight, etc.

Control of chlorosis by acidification of soils is said to be ordinarily too expensive to be practical, thus requiring the selection of varieties less sensitive to lime.

Combating downy mildew of grape in 1913, L. SAURET (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 35 (1914), No. 19, pp. 582–587*).—In continuation of previous work (E. S. R., 29, p. 50) the author gives an account of experiments conducted in Narbonne in 1913 for the control of the downy mildew of grape.

Different treatments were given vines, and it was found that liquid fungicides containing 2 kg. of copper sulphate to 1 of lime or carbonate of soda were sufficient in 1913, as in 1912, to protect completely both the leaves and the grapes. Powdered fungicides containing copper may be successfully used, but in most cases it was found advisable to supplement these treatments with liquid applications. The efficiency of the treatment was greatest the more nearly it was applied at the time of susceptibility and the nearer to rains accompanied by conditions for infection. There was found to be little choice in the use of fungicides whether they were acid or basic, and pronounced basic solutions gave very efficient results.

In conclusion the author states that if the fungicide is well made, abundantly applied, and followed by the use of a powder, it is possible to protect vines against mildew for 15 days after each application.

A preliminary report on raspberry curl or yellows, L. E. MELCHERS (*Ohio Nat., 14 (1914), No. 6, pp. 281–288, figs. 5*).—This disease is said to be one of the most serious to which the raspberry is subject. It has been attributed to various causes, but it is considered by the author as identical with that described by Detmers (E. S. R., 3, p. 411), where the disease is attributed to bacteria. The raspberry curl is said to occur mainly on Cuthbert, Marlboro, Golden Queen, Early King, and Herbert, the varieties being susceptible in the order named. It generally makes its appearance the second year after planting, although sometimes not until the third year does it become sufficiently abundant to attract attention. After it becomes established in a plant it reappears to a greater or less extent as long as that plant lives. One of the more striking symptoms of the disease is said to be the stunted appearance of the plant. The canes are short and bushy, the plants flower prematurely, the leaf blades are arched upward, and the berries mature from ten days to two weeks earlier than the normal crop. Where berries are ripened they are small, deformed, light in color, and have a disagreeable flavor.

For the control of this disease the author recommends planting of red raspberries from regions where the raspberry curl is not known to be present and the growing of varieties which are not known to be especially subject to the disease. The plants should be set in rather light or medium heavy soil provided with adequate drainage and well manured in order to produce vigorous growth. All plants showing the presence of the disease should be removed and destroyed.

American gooseberry mildew, F. J. CHITTENDEN (*Jour. Roy. Hort. Soc. [London], 39 (1913), No. 2, pp. 373–378*).—The progress of *Sphærotheca mors-uvæ* attacking gooseberries at Wisley since 1910 is noted in connection with measures for its control. Pruning was successful in 1911, but not in 1912. Spraying with potassium sulphid in 1913 did not check the disease very effectively, but did cause a considerable loss of foliage in some cases. No variety seemed to escape the disease completely.

Observations on the perithecial stage of the American gooseberry mildew, E. S. SALMON (*Jour. Agr. Sci. [England], 6 (1914), No. 2, pp. 187–193, figs. 11*).—The author has reported some observations on the winter stages of the gooseberry mildew (*Sphærotheca mors-uvæ*).

In 1913 the winter stage was found to be developing as early as May 26, and by June 6 the perithecia were found in abundance. This indicated that the winter stage may be formed almost at the beginning of an attack, the process of inoculation, incubation, and development of both summer and winter stages occupying only 11 days. Specimens of the winter stage exposed on the bush throughout the winter did not in February show any mature asci in the perithecia.

Investigations are in progress to determine under what conditions, if any, such perithecia may mature.

Notes on a new treatment for American gooseberry mildew, G. DOROGIN (*Ztschr. Pflanzenkrank., 23 (1913), No. 6, pp. 334, 335*).—The author reports some preliminary experiments.

The complete treatment as recommended for American gooseberry mildew includes the removal and destruction in autumn of all suspected parts of the plants, followed immediately and again in early spring by spraying plants and earth with 1 to 3 per cent iron sulphate, and spraying the young foliage every 10 days with 0.5 per cent soda, 0.25 per cent soda and potash, or 0.25 per cent potash.

Disease of Veronicas, IVY MASSEE (*Gard. Chron., 3. ser., 55 (1914), No. 1429, p. 335, fig. 1*).—The author reports that among specimens of diseased plants sent in for examination, one of *V. hulkeana* was found to be attacked by *Peronospora grisea*, heretofore thought to be restricted to wild species of Veronica. The young leaves dry and wither, the under surface showing a dingy white mildew, proving to be the fungus named. Growth in case of attack of *V. hulkeana* is checked by death of the young leaves and shoots, while some other species of Veronica are little affected by its presence.

The diseases of nut trees, M. B. WAITE (*North. Nut Growers Assoc. Proc., 4 (1913), pp. 50–59*).—In this paper the author gives a brief account of the principal diseases of the hickory, pecan, and walnut, calling attention to the fact that the native parasites attack the introduced species to a very considerable extent, while the attack on the native species is of comparatively little consequence.

Present state of the chestnut blight, J. F. COLLINS (*North. Nut Growers Assoc. Proc., 4 (1913), pp. 25–29*).—The author has given a popular summary of the present state of information relating to the chestnut blight in this country, and called attention to the discovery in China of a disease which is supposed to be identical with the chestnut disease in this country (E. S. R., 29, p. 753).

The question of resistance of varieties to chestnut blight is discussed at considerable length. In noting its distribution the author states that it is known to occur in Maine, New Hampshire, Vermont, New York east of the Catskills and as far north as Lake George, and generally as far south as northern Virginia. One nursery has been reported in North Carolina as infected, and chestnut trees in British Columbia are also reported as having the disease.

The chestnut blight in Virginia, F. GRAVATT (*Rpt. State Ent. and Plant Path. Va., 9 (1912–13), pp. 21–25*).—The author states that chestnut blight is established in 19 counties in northern Virginia and that the chief work carried on in connection with this disease in Virginia has been the general inspection of the State and the destruction of trees showing the disease in advance isolated localities.

Warty roots of Gymnocladus canadensis, A. SPERLICH (*Ztschr. Pflanzenkrank., 23 (1913), No. 6, pp. 321–331, figs. 7*).—Illustrations and descriptions are given of tumorous swellings on roots of *G. canadensis* and other abnormalities noted in connection therewith. It is stated that the abundant deposit of material in the tumorous regions interferes with the normal movement of nutritive or elaborated materials, some of the growths showing internally some characters of branches.

Some observations on plant diseases caused by parasitic fungi, P. MAGNUS (*Jahresber. Ver. Angew. Bot., 11 (1913), pt. 1, pp. 14–18, fig. 1*).—Noting the progress of *Oïdium quercinum* in northern France, the author states that this fungus, said to be of American origin and to attack ordinarily the American

species *Quercus rubra* and *Q. palustris* less severely than the European species *Q. tozza*, *Q. pedunculata*, and *Q. cerris*, has recently shown increased activity on *Q. rubra*. It is said also to have been noted recently as attacking *Colutea arborescens* in several places.

It is also stated that *Dædalea unicolor*, usually mentioned as saprophytic on live trees, has been noted as parasitic on *Æsculus hippocastanum*, *Fagus sylvatica*, *Robinia pseudacacia*, Betula, *Acer rubrum*, and *A. platanoides*.

The fight against dry rot of pine and fir trees, A. Möller (*Ztschr. Forst u. Jagdw., 46 (1914), No. 4, pp. 193–208*).—In extension of work previously reported (E. S. R., 23, p. 653), the author states that results of his recent studies involving infection of pine and fir with *Trametes pini* support the claim of Hartig (E. S. R., 7, p. 512) to the effect that the dry rots of these conifers are due to the same fungus, *T. pini*.

Studies on dry rot attacking wood, C. Wehmer (*Jahresber. Ver. Angew. Bot., 11 (1913), pt. 1, pp. 106–116, figs. 5*).—This article refers to work previously reported (E. S. R., 31, p. 248). *Merulius lacrymans* attacked wood only when the mycelium grew out from an old infection.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

A review of the spread of the chief injurious animals in Russia during 1912, I. A. Portchinsky (*Ezhcg. Dept. Zeml. [Russia], 1912, pp. 351–361, pls. 3; abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 3, pp. 197–199*).—A general discussion of the subject.

The mongoose in Trinidad and methods of destroying it, F. W. Urich (*Bd. Agr. Trinidad and Tobago Circ. 12 (1914), pp. 16, pls. 2; Bul. Dept. Agr. Trinidad and Tobago, 13 (1914), No. 81, pp. 196–208, pls. 2*).—The mongoose (*Herpestes mungo*), which was introduced into Trinidad about 1870 by a sugar estate in the Naparimas for the purpose of controlling rats which were pests in that district, has since become a pest of considerable importance.

Birds of town and country, H. W. Henshaw (*Nat. Geogr. Mag., 25 (1914), No. 5, pp. 494–531, figs. 66*).—A pictorial description in colors is given of 64 of the common birds in addition to the 50 considered in the work previously noted (E. S. R., 28, p. 853).

The food of birds, Laura Florence (*Trans. Highland and Agr. Soc. Scot., 5. ser., 26 (1914), pp. 1–74*).—This report, in continuation of that previously noted (E. S. R., 27, p. 550), presents results of examinations of the crop contents of 1,390 birds. The majority of these birds are said to have been shot while feeding on agricultural land and to have been obtained chiefly in the northeastern counties of Scotland.

Some further observations on the dispersal of weed seeds by wild birds, W. E. Collinge (*Jour. Econ. Biol., 9 (1914), No. 2, pp. 69–71*).—A brief statement of the work carried on in continuation of that previously noted (E. S. R., 30, p. 248).

Insect pests and fungoid diseases [in Barbados, 1912–13], J. R. Bovell and W. Nowell (*Rpt. Dept. Agr. Barbados, 1912–13, pp. 33–43; abs. in Agr. News [Barbados], 13 (1914), Nos. 315, pp. 170, 171; 316, p. 186*).—A brief review of the occurrence of the more important insect enemies of the year.

Insect pests in British Guiana, G. E. Bodkin (*Rpt. Dept. Sci. and Agr. Brit. Guiana, 1912–13; abs. in Agr. News [Barbados], 13 (1914), No. 318, pp. 218, 219*).—This report deals with the insect pests under the headings of the principal crops of the colony.

Report of the chief entomologist to the zemstvo on injurious insects and diseases of plants in the Government of Taurida during the year 1912,

S. A. MOKRZECKI (*Abs. in Rev. Appl. Ent., 1 (1913), Ser. A, No. 10, pp. 361–364*).—Among the more important insects discussed are the pear psylla, the gipsy moth, *Phlyctænodes sticticalis*, the codling moth, *Ino ampelophaga*, euonymus scale, the pear thrips which was found on pear trees in Alushta, etc.

Report of the assistant entomologist to the zemstvo on injurious insects and diseases of plants in the Government of Taurida during the year 1912, I. M. SHTCHEGOLEV (*Abs. in Rev. Appl. Ent., 1 (1913), Ser. A, No. 10, pp. 357–359*).—A detailed report of the occurrence of the more important insect pests of the year.

Division of entomology, annual report, 1912–13, C. P. LOUNSBURY (*Union So. Africa Dept. Agr. Rpt., 1912–13, pp. 271–296, pls. 5*).—This presents details of the work for the period from January 1, 1912, to March 31, 1913, and reports on the occurrence of the more important pests, control measures, plant inspection, etc. A supplementary report of the Cape Province entomologist, C. W. Mally, is appended.

Insect enemies of corn, F. SHERMAN, JR. (*Bul. N. C. Dept. Agr., 35 (1914), No. 5, pp. 56, figs. 21*).—A popular account of the more important insect enemies of corn with remedial measures therefor.

The insect enemies of cotton in German East Africa, H. MORSTATT (*Pflanzer, 10 (1914), Beiheft 1, pp. X+49, pls. 3*).—This is a brief discussion of the more important insect enemies of cotton and control measures therefor. A work on the insect enemies of the cotton plant in the German colonies by Aulmann has previously been noted (E. S. R., 29, p. 653).

The entomology of Helianthus, T. D. A. COCKERELL (*Entomologist, 47 (1914), No. 614, pp. 191–196*).—A report of observations of the insect fauna of the sunflower.

Experiments on fighting the pests of winter rape (*Prel. Rpt. Bio-Ent. Sta. Bessarabia, 1913, pp. 5; abs. in Rev. Appl. Ent., 1 (1913), Ser. A, No. 10, pp. 395, 396*).—The cultivation of winter rape is said to have decreased greatly in Bessarabia, owing chiefly to the damage done to it by insect pests, the most serious of which are the larvæ of the sawfly *Athalia spinarum*, which feeds usually on grasses, and *Entomoscelis adonidis*.

Insect pests of sugar cane in British Guiana, H. W. B. MOORE (*Abs. in Agr. News [Barbados], 13 (1914), No. 319, pp. 234, 235*).—A discussion of the more important enemies of sugar cane.

Insect damage to the cones and seeds of Pacific coast conifers, J. M. MILLER (*U. S. Dept. Agr. Bul. 95 (1914), pp. 7, pls. 3*).—This bulletin gives information regarding the character and extent of insect damage to the cones and seed of coniferous forests of the Pacific slope, thus supplementing the information on the subject previously noted (E. S. R., 16, p. 175; 18, p. 255; 28, p. 657). It also furnishes preliminary information on the more important groups of insects causing this damage, and their habits. The names of none of the insects causing the injury have been mentioned since it is intended that a special bulletin on the subject will be issued.

Spraying apple trees in blossom with tobacco extract, S. GLAZENAP (*Trudy Büro Prikl. Bot. (Bul. Angew. Bot.), 6 (1913), No. 4, pp. 243–250; abs. in Rev. Appl. Ent., 1 (1913), Ser. A, No. 10, pp. 370, 371*).—In combating the apple psyllid the author has met with success in the application while the apples are in bloom of tobacco extract, prepared by boiling 1 lb. of *Nicotiana rustica* for 15 minutes in 3 gal. of water, and then diluting with 6 gal. of water. It is stated that the spraying, which was done while the trees were in full bloom, did not affect the bees, and was sufficient to destroy *Psylla mali*, young caterpillars of *Cheimatobia brumata*, Tortricidæ, and similar pests.

The use of lime and sulphur solution on citrus trees, W. W. YOTHERS (*Fla. Grower, 10 (1914), No. 16, pp. 10, 11*).—The author presents a brief report of results obtained from the application of lime-sulphur in the control of mites on citrus in Florida.

Applications of lime-sulphur for the control of the rust mite on July 18, when there were many eggs and adults present, indicate that it is unnecessary to use dilutions stronger than 1:75 since this kills all adults and eggs. Dilutions of 1:75 are said to kill also eggs and adults of both the 6-spotted mite (*Tetranychus sexmaculatus*) and the purple mite (*T. mytilaspidis*).

While lime-sulphur was not so effective as oil sprays in killing the purple scale, experiments show it to be suitable for this purpose. Fruit sprayed three times with a dilution of 1:25 had only about one-fourth as many scales per orange as were found on unsprayed fruit. It is stated that the white flies are not affected by lime-sulphur, in several experiments dilutions of 1:9 having no appreciable effect upon the pupa. The author mentions having observed that lime-sulphur has some stimulating effect upon the growth of the foliage. Attention is called to the fact that it should not be used on ripe fruit at dilutions stronger than 1:40 or 1:45.

The use of carbon bisulphid in emulsion at Martinique and Guadeloupe, G. BORDAZ (*Abs. in Agr. News [Barbados], 13 (1914), No. 317, pp. 202, 203*).—Applications of carbon bisulphid in kerosene emulsion have been found of value in destroying white grubs, eelworms, and a root disease, probably a Rosellinia disease. The most efficacious method in cacao and coffee plantations is to pour the emulsion around the foot of each tree.

The locust pest, C. R. JONES and D. B. MACKIE (*Philippine Agr. Rev. [English Ed.], 6 (1913), No. 9, pp. 8, pls. 2; Philippine Bur. Agr. Circ. 23 (1913), pp. 8, pls. 2*).—These data have been substantially noted from another source (E. S. R., 28, p. 753).

Thrips as pollinators of beet flowers, H. B. SHAW (*U. S. Dept. Agr. Bul. 104 (1914), pp. 12, pls. 3, figs. 5*).—During the course of studies of the rôle of thrips in the pollination of sugar beets several species were collected from beet flowers at Garland, Utah, including *Heliothrips fasciatus*, *Frankliniella fusca*, and *F. tritici*. It is stated that *Thrips tabaci* was the species most abundant in Ogden, Utah, during the seasons of 1911 and 1912.

The investigations show that thrips are active agents in pollination, being very numerous among beet flowers and effecting both close pollination and cross-pollination. After taking into account the various forms of injury which they cause, however, the author considers it doubtful whether the balance remains in their favor in regard even to beets. "Under ordinary conditions, in fields of commercial seed beets, it is believed that on the whole their work is beneficial; but should they become excessively numerous, they sustain their reputation as one of our really destructive pests. To the horticulturist and plant breeder they are pests of the worst type, necessitating constant watchfulness and a refined technique in all pollination work.

"The suggestion is ventured that certain supposed mutations may really have been the result of unsuspected cross-pollination by means of one or another species of thrips, whether in cereals supposedly not susceptible to cross-pollination without the intervention of man or in flowers which were thought to have been isolated against cross-pollination."

New genera and species of Thysanoptera, with notes on distribution and food plants, A. C. MORGAN (*Proc. U. S. Nat. Mus., 46 (1914), pp. 1–55, figs. 79*).—Three genera and 19 species are described as new to science, among which are *Euthrips floridensis*, taken on *Asclepias variegata* and in blossoms of *Catalpa catalpa*, at Quincy, Fla.; *E. hawaiiensis* from cotton at Honolulu;

E. gossypii collected from the tips of the leaves of cotton at Yuma, Ariz.; *Rhipiphorothrips pulchellus* n. g. and n. sp., from the banyan tree, Philippine Islands; *Microthrips piercei* n. g. and n. sp., collected from cotton and Vernonia at Dallas, Tex., and from papaw at Clarksville, Tenn.; *Horistothrips australiæ* n. g. and n. sp., collected under dead scales of Eriococcus on Eucalyptus at Swan River, Australia; etc.

New locality and food plant records for certain Thysanoptera are appended.

Attempts to find disease germs in the European bedbug (Cimex lectularius) after feeding experiments in various diseases, leprosy, lymphadenoma, carcinoma, etc., D. THOMSON (*Ann. Trop. Med. and Par., 8 (1914), No. 1, pp. 19–28*).—"Four hundred and fifty-five bedbugs were employed in this research; of these 184 were used as controls. Insufficient research has been carried on with regard to the possibility of the transmission of disease in temperate climates by bloodsucking insects occurring in these climates. Protozoal parasites do not appear to exist normally in the European bedbug. No acid-fast bacilli were found in 105 bedbugs fed on lepers, nor in 35 bedbugs caught on the bed mattresses of leper patients. In the few experiments conducted nothing abnormal was found in bugs fed on cases of lymphadenoma, chronic lymphatic leukemia, sarcoma, carcinoma, and malaria. Forty bedbugs fed on a case of spleno-medullary leukemia all developed numerous Charcot-Leyden crystals in their intestines."

An egg parasite of the tarnished plant bug (Lygus pratensis), C. R. CROSBY and M. D. LEONARD (*Canad. Ent., 46 (1914), No. 5, pp. 181, 182, figs. 2*).—Under the name *Anagrus orijentatus* the authors describe a new parasite reared from eggs of *L. pratensis* in October, 1913, at Ithaca, N. Y.

A contribution toward a monograph of the homopterous insects of the family Delphacidæ of North and South America, D. L. CRAWFORD (*Proc. U. S. Nat. Mus., 46 (1914), pp. 557–640, pls. 6*).—This is a synopsis of a family closely related to the Fulgoridæ.

On the susceptibility and immunity of vines to the attacks of phylloxera, C. BÖRNER (*Biol. Centbl., 34 (1914), No. 1, pp. 1–8; abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 3, pp. 156, 157*).—A report is given of experiments carried on by the author in Villers l'Orme, near Metz, by Brichon in Pagny-sur-Moselle, and by Antelin in Nancy, on the resistance of different vines to attacks of phylloxera. The most important result of the experiments is to show that the effect produced upon vines by the Lorraine phylloxera is quite different from that produced by the south of France form. The author concludes that there are two species of phylloxera and designates the Lorraine form as *Phylloxera pervastatrix*.

The fumigation of citrus trees, L. GOUGH (*Agr. Jour. Egypt, 4 (1914), No. 1, pp. 17–29*).—This paper gives a brief account of the habits of the Coccidæ which infest citrus trees in Egypt and means of combating them.

Sweet potato sphinx, J. C. FAURE (*Agr. Jour. Union So. Africa, 7 (1914), No. 4, pp. 515–519, fig. 1*).—The sweet potato sphinx moth (? *Herse convolvuli*) is said to cause serious damage to the sweet potato in Natal, reducing the crop from 25 to 50 per cent, and perhaps more.

Oak pests.—The carpenter worm (Prionoxystus robiniæ), L. CHILDS (*Mo. Bul. Com. Hort. Cal., 3 (1914), No. 7, pp. 259–264, figs. 6*).—It is stated that California live oaks, as well as poplars, willows, locusts, and elms, are in many localities attacked and greatly damaged by this pest through the larva feeding in the trunks and larger limbs.

Phlyctænodes sticticalis, its life history and methods of fighting it, S. A. MOKRZECKI (*Abs. in Rev. Appl. Ent., 1 (1913), Ser. A, No. 10, pp. 359–361*).—This pyralid moth is said to occur everywhere in European Russia, as well as

in Siberia and Russian Turkestan, and to have been imported to the United States, where it was first found in 1869 and where it caused considerable damage to the beet crops in 1909 and 1910. A detailed report of its life history and remedial measures is given.

Serious outbreak of Phlyctænodes sticticalis near Poltava. N. V. KURDJUMOV (*Khutorŭanin, No. 26 (1913), pp. 697, 698; abs. in Rev. Appl. Ent., 1 (1913), Ser. A, No. 10, p. 394*).—A brief discussion of outbreaks of this pest with recommendations as to remedial treatment. A detailed account of this pest is given in the article above.

The codling moth in Uruguay. E. LAHILLE (*Rev. Asoc. Rural Uruguay, 42 (1913), No. 8–9, pp. 645–648; abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 3, p. 162*).—The author states that in Uruguay adult codling moths are destroyed by bonfires lit in the evening around pear and apple trees when in blossom.

A small manual on malaria. L. M. PARROT (*Petit Manuel du Paludisme. Paris, 1914, pp. 32, figs. 11*).—This work, which is intended for the use of schools in North Africa, gives information on the nature of the malarial parasite and of the mosquito and its rôle in the transmission of the parasite and means of combat.

Mosquitoes and malaria. J. C. FAURE (*Agr. Jour. Union So. Africa, 7 (1914), No. 2, pp. 223–242, figs. 13*).—This is a general discussion of the subject.

A synopsis of the described North American species of the dipterous genus Tipula. W. G. DIETZ (*Ann. Ent. Soc. Amer., 6 (1913), No. 4, pp. 461–484*).—The synopsis here presented is in tabular form. A list with habitat and bibliography of the North American species described since the publication of Aldrich's Catalogue of North American Diptera is appended.

Heredity of bristles in the common greenbottle fly, Lucilia sericata.—A study of factors governing distribution. P. W. WHITING (*Amer. Nat., 48 (1914), No. 570, pp. 339–355, fig. 1*).—"Taking a general summation of all the bred material of *L. sericata*, we find that reduction affects the males while addition affects the females. Of the 5,367 flies bred, 2,708 are males and 2,659 are females, giving practical equality. Reduction in the males is 748.5 bristles, while in the females it is only 455.5 bristles. As has been noted before, the degree of reduction in the females is increased by the later generations of strain 1913–A, by reason of the fact that reduction rarely goes beyond the loss of two bristles in a single fly. Thus when most of the flies of a population become reduced to this extent it is evident that reduction in the males would be but slightly in advance of that in the females.

"There are 210 bristles added in the males, while there are 343 added in the females. Thus addition affects the females more than the males. These figures for bristles added represent number of bristles, and thus no distinction is made between bristles of large and bristles of small size."

The skin maggot of man. C. FULLER (*Agr. Jour. Union So. Africa, 7 (1914), No. 6, pp. 866–874, fig. 1*).—This paper relates to *Cordylobia anthropophaga*.

An attempt to transmit poliomyelitis by the bite of Lyperosia irritans. E. FRANCIS (*Jour. Infect. Diseases, 15 (1914), No. 1, pp. 1–5, figs. 2*).—In several experiments conducted flies (*L. irritans*) that had sucked the blood of infected rhesus monkeys twice daily for periods of four and six days from the time of their inoculation with poliomyelitis virus to their death and were allowed to feed on healthy rhesus monkeys twice daily during the same periods and two or three times daily during periods ranging from six to eight days following, failed to transmit the disease.

Flies in relation to disease.—Nonbloodsucking flies. G. S. GRAHAM-SMITH (*Rev. in Science, n. ser., 39 (1914), No. 1013, pp. 787–789*).—A review by L. O. Howard of the work previously noted (E. S. R., 30, p. 552).

A synopsis of the genera of Agromyzidæ, with descriptions of new genera and species, J. R. MALLOCH (*Proc. U. S. Nat. Mus., 46 (1914), pp. 127–154, pls. 3*).—A synopsis of a dipterous family of considerable economic importance.

An account of the bionomics and the structure of dipterous larvæ occurring in human foods with particular reference to those which have been recorded as accidental parasites of man.—I, The cheese skipper (Piophila casei), D. C. MOTE (*Ohio Nat., 14 (1914), No. 7, pp. 309–316, figs. 16*).—"The cheese skipper because of its ravages on cheeses and smoked meats and its possible relation to myiasis is of considerable economic importance. The fly deposits its eggs upon bacon, cheeses, smoked ham, slightly putrid beefsteak. Duration of egg stage, 23 to 54 hours. Larvæ feed upon bacon, cheese, ham, beef, oleomargarine. This insect gets its common name from the peculiar leaping or skipping habit of the larva. Duration of larval instar, 14 days. Pupation occurs in drier places than those in which the larvæ feed. Duration of pupal stage, 12 days. The flies in an experiment seemed to prefer beefsteak with a slightly putrid odor in preference to ham, bacon, or cheese for egg deposition. The adult flies lived longer, and the larvæ fed and matured more readily, on the beefsteak than on the other substances."

Biological notes concerning Drosophila ampelophila, F. E. LUTZ (*Jour. N. Y. Ent. Soc., 22 (1914), No. 2, pp. 134–138*).—Data are presented on the development of the different stages of the pomace fly, based on observations of some 400 individuals.

The biology of Ceratophyllus fasciatus, the common rat flea of Great Britain, C. STRICKLAND (*Ann. Rpt. Local Govt. Bd. [Gt. Brit.], 42 (1912–13), Sup. Rpt. Med. Off., pp. 401–412; Jour. Hyg. [Cambridge], 14 (1914), No. 2, pp. 129–142*).—The results of life history studies of this flea have been summarized as follows:

"The duration of the various stages is very variable, even under the same conditions. Temperature and humidity are the two conditions which have most influence. . . . On an average, the egg hatches out in 5 to 14 days, an increase of humidity having a retarding, and a moderately high temperature a slight accelerating effect. The larva is soon killed by a high temperature (70° F.) combined with a low degree of humidity (40 per cent). However, under these conditions, the larvæ will live longer if rubbish is present, for they are then able to bury themselves in it and thus obtain a certain amount of moisture. The pupal stage is much prolonged by cold, but this is partly due to the nonemergence of the imago, even when it is fully formed. The imago, at least when unfed, dies off much more rapidly in summer than in winter. Eggs are laid by the imago even at comparatively low temperatures (50°).

"The larvæ and imagines like to bury themselves in rubbish, and under these circumstances their duration of life is much prolonged, even when other external conditions are somewhat severe. When copulating, the imago frequently lives at least two months, but it will not copulate unless it is fed on rat's blood. It feeds readily on man and many other animals, but will not copulate after feeding on these facultative hosts, even though at least one of them—man—seems to be more attractive to it than its normal host, the rat. Oviposition invariably takes place within 24 hours of copulation, even when the insect has only been fed once after being starved for a period of many weeks. The rat's blood, therefore, probably contains some substance that possesses a stimulating effect on the flea's sexual organs. When starved, the imago will live for a very long time—at least 17 months—but only in the presence of rubbish in which it can bury itself. In the absence of rubbish the flea will only live for about a month, even under the most favorable conditions of temperature and humidity.

"From the foregoing observations it is clear that the presence of rubbish containing organic matter is essential for the development of the flea."

Buprestids collected in the Philippine Islands, C. KERREMANS (*Philippine Jour. Sci., Sect. D, 9 (1914), No. 1, pp. 83–90, fig. 1*).—Twenty-eight species are here listed, of which 12 are described as new to science.

Notes on Rhabdocnemis obscurus in Australia, A. A. GIRAULT (*Canad. Ent., 46 (1914), No. 5, pp. 174–179*).—The author presents notes on the biology of this borer, which has been the source of injury to sugar cane in north Queensland.

The Tenebrionidæ of the Philippines, H. GEBIEN (*Philippine Jour. Sci., Sect. D, 8 (1913), Nos. 5, pp. 373–400; 6, pp. 401–433*).—This paper records 88 forms, of which 4 genera and 41 species are described as new to science.

The cowpea weevil (Pachymerus chinensis), J. A. KRALL (*Oklahoma Sta. Circ. 31 (1914), pp. 8*).—In an introduction to this circular C. E. Sanborn summarizes the measures which have been the most satisfactory in controlling the cowpea weevil, which has caused an almost total destruction in the bin of seed peas in Oklahoma. Notes on controlling the cowpea weevil follow.

In cold storage experiments cowpeas kept at temperatures as low as from 26 to 31° F. for periods ranging from 58 to 184 days gave a germination of 86 to 95 per cent and varied but little from the checks kept. The observations show that when any of the stages in the life cycle of this weevil are subjected to a temperature of 32° or below they will not mature. Notes on hot water, dry heat, carbon bisulphid, and kerosene treatments follow. The remedies recommended include immersion of the seeds in water at a temperature of 130° for 1 minute and after 2 minutes' interval a submersion for another minute; heating of the seed in a steady temperature of 130° for a period of 2 to 4 hours; use of 1 lb. of carbon bisulphid to 40 bu. of seed in an air tight bin; and spraying peas, thinly and evenly spread on a canvas or floor, with kerosene at the rate of 1 pint to 10 bu. or 600 lbs. of peas. In the kerosene treatment an atomizer, hand spray pump, or very fine sprinkler should be used, after which the peas should be shoveled so as to bring the treated and untreated seed together until all have an equal coating of the kerosene.

The temperature of the bee colony, B. N. GATES (*U. S. Dept. Agr. Bul. 96 (1914), pp. 29, figs. 8*).—This paper is based upon work conducted during the period extending from October 22, 1907, to September 26, 1908, during which time over 2,576 observations and 20,000 separate readings were made. It describes the apparatus made use of, the arrangement of the thermometers, methods of observation and recording, the consumption of stores in winter, general phenomena of the cluster in winter, the temperature below frames in relation to the outside air, comparisons of temperatures of the center of the cluster and of the outside air, effects of manipulation on the cluster, behavior of the cluster in winter, temperature accompanying the laying of the first eggs, transition from winter to summer conditions, general phenomena of the summer temperature, the effect of "orientation" or "play flights," effects of cluster heat on the temperature below the frames, the effects of storm, and the effects of transportation on the temperature of the colony.

A paper relating to the subject from the same Bureau has been recently noted (E. S. R., 31, p. 254).

Bee diseases and bee enemies, R. S. MACDOUGALL (*Trans. Highland and Agr. Soc. Scot., 5. ser., 26 (1914), pp. 150–169, figs. 2*).—This general account of the subject summarizes the main results of recent work.

Foul brood, F. E. MILLEN (*Michigan Sta. Spec. Bul. 64 (1914), pp. 8*).—This bulletin, which is supplementary to one recently noted (E. S. R., 28, p. 456),

deals with sacbrood and also gives the text of the state law relative to bee inspection in Michigan.

Annual report of the Bee-Keepers' Association of the Province of Ontario, 1913 (*Ann. Rpt. Bee-Keepers' Assoc. Ontario, 1913, pp. 72*).—The proceedings of the annual meeting are here presented.

The relation of the honeybee to other insects in cross pollination of the apple blossom, J. W. McColloch (*Trans. Kans. State Hort. Soc., 32 (1912–13), pp. 85–88, fig. 1*).—The author presents a chart which shows the number of different insects that visited apple blossoms at the Kansas Experiment Station, with the comparative number of honeybees. During the course of observations made to determine the number of blossoms a honeybee would visit on a trip, a bee which already carried some pollen on its legs was followed while it visited 61 blossoms, and was then lost sight of in the top of the tree. Another was watched while it visited 53 blossoms and several were followed while they visited from 25 to 40 blossoms.

A pine pest (Lophyrus pini), P. Nikolaev (*Khutorŝanin, No. 25 (1913), pp. 676, 677; abs. in Rev. Appl. Ent., 1 (1913), Ser. A, No. 10, p. 395*).—The larvæ of a sawfly (*L. pini*) are said to have appeared in southwestern Russia and to have been the source of great injury to pine forests, especially to young trees. There are two annual broods, the first ovipositing in May and the second appearing early in August.

Descriptions of new Hymenoptera, VIII, J. C. Crawford (*Proc. U. S. Nat. Mus., 46 (1914), pp. 343–352, figs. 8*).—Among the species here described that are of economic importance are *Trissolcus trinidadensis* reared from the eggs of *Sphyrocoris obliquus* on cotton, *Perilampidea syrphi* n. g. and n. sp. from the larva of a syrphid preying on *Dactylopius citri* on cacao, *Ooencyrtus chrysopæ* from the eggs of *Chrysopa* sp., *Signiphora giraulti* from *D. citri*, and *Gonatocerus anomocerus* from the eggs of *Horiola arcuata*, all in Trinidad; and *Derostenus fullowayi* reared from *Agromyza diminuta* at Honolulu, Hawaii.

Descriptions of twenty-three new genera and thirty-one new species of ichneumon flies, H. L. Viereck (*Proc. U. S. Nat. Mus., 46 (1914), pp. 359–386*).—*Metcorus mamestræ*, reared from *Mamestra trifolii*, at Rocky Ford, Colo., is among the species here described as new to science.

Descriptions of two new genera of parasitic Hymenoptera, S. A. Rohwer (*Psyche, 21 (1914), No. 2, pp. 79–81, figs. 2*).—Two parasites, here described as representing new genera and species, have proved to be of economic importance in relation to the chestnut, namely, *Anomopterus fasciipennis*, a primary parasite of *Ectædemia phlœophaga*, at Falls Church, Va.; and *Centistidea ectœdemiæ*, a primary parasite of *E. castaneæ*, at Ballston, Va.

A new scelionid parasite of locust eggs from the Northern Territory of Australia, A. A. Girault (*Entomologist, 47 (1914), No. 614, p. 197*).—The parasite here described as new, namely, *Scelio semisanguineus*, was captured over acridid egg beds on sandy soil, at Port Darwin, Northern Territory.

FOODS—HUMAN NUTRITION.

The problem of the food supply as to breadstuffs and kindred articles (*Chamber Com. U. S. A., Gen. Ser., Bul. 84 (1914), pp. 220–223, figs. 2*).—Statistical data are brought together in this article which combats the opinion that a widespread shortage of food supplies is to be expected in the future.

Making, examining, and judging bouillon cubes, H. Serger (*Ztschr. Öffentl. Chem., 20 (1914), Nos. 5, pp. 81–88; 6, pp. 101–109*).—Analytical and other data are summarized and discussed.

Concerning the fat of the European coot (Fulica atra). S. Blaha (*Hoppe-Seyler's Ztschr. Physiol. Chem., 89 (1914), No. 6, pp. 456–464*).—The European coot is little used as a game bird owing to the fact that the flesh has a decidedly unpleasant odor and taste. This is not noticeable if the skin is removed before cooking and the bird carefully cooked. The results obtained in a study of the fat show that the peculiar odor and taste should not be attributed to it. On the other hand, the author succeeded in isolating from the flesh a base which possessed all the characteristics of methylamin, and he attributes the odor and flavor observed to the presence of monomethylamin.

Canned salmon—cheaper than meats, and why (*U. S. Dept. Com., Bur. Fisheries Econ. Circ. 11 (1914), pp. 11*).—A number of recipes are given for dishes made with canned salmon, the importance of this foodstuff is pointed out, and its nutritive value in comparison with other foods is discussed.

Studies of the effects of corn as a food—utilization of corn protein by man, S. Baglioni (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 22 (1913), II, No. 11, pp. 608–615*).—The results are reported of experiments in which the relative food values of corn polenta (mush), a wheat polenta, and bread and meat were compared.

In the subjects of these experiments during the periods of exclusive vegetable diet undernutrition was observed with loss of nitrogen and a decrease in body weight of about 1 kg. A greater quantity of nitrogen was introduced with the diet of corn polenta, but relatively less was absorbed than in the case of the wheat polenta.

The conclusion is drawn from these experiments that an exclusive diet of corn is inferior to one of wheat and that both are inferior to a mixed diet of bread and meat.

Unpolished rice and the prevention of beri-beri, H. Fraser and A. T. Stanton (*Lancet [London], 1914, I, No. 2, pp. 96–98, fig. 1*).—The authors report additional data regarding the use of unpolished rice as a cause of beri-beri, which apparently indicates that polished rice can be used safely provided it has a phosphorus content of not less than 0.4 per cent. The belief is expressed that the use of a polished rice of this standard would tend in a great measure to prevent the spread of beri-beri. See also earlier work (E. S. R., 28, p. 168.)

Toxic brans, Marchadier and Goujon (*Ann. Falsif., 7 (1914), No. 64, pp. 77–81*).—From a digest of the data regarding the toxic effects of bran, the authors make the following recommendations: Bran showing an acidity less than 0.15 per cent should be regarded as normal; that having an acidity between 0.15 and 0.3 per cent should be regarded as being in a state of transformation not yet dangerous but liable to rapid decomposition; that showing an acidity greater than 0.3 per cent should be regarded as unfit for food.

Contribution to the study of baker's yeasts, E. Kayser (*Ann. Inst. Nat. Agron., 2. ser., 12 (1913), No. 2, pp. 345–377, figs. 13*).—From the experimental data here reported, the author concludes that baker's yeasts should be studied with a view to determining the optimum temperature and rate of action, in order to ascertain which yeast is best suited for a particular use. It is stated that yeasts contaminated with mycoderma may be used in bread making, but, although they are more active, they produce a less satisfactory product. Trials and microscopic examinations of the different yeasts are recommended as giving the best index of their relative efficiency.

Food poisoning due to cream cakes, Chantemesse and Rodriguez (*Bul. Acad. Méd. [Paris], 71 (1914), No. 7, pp. 245–259; rev. in Jour. Amer. Med. Assoc., 62 (1914), No. 12, pp. 939, 940*).—An account is given of poisoning due

to eating cream cakes, and specifically to the meringue which covered them. The interior portion of the meringue, it was found, contained a peculiarly toxic paratyphoid bacillus. It is pointed out that when the surface of the meringue was browned, the heat did not penetrate the interior and sterilize it, and that the egg white furnished a favorable medium for the development of the contaminating organism. Similar cases of illness were traced to the same bakery, and it was discovered that the cook was a paratyphoid carrier.

Molasses (*Maine Sta. Off. Insp. 59 (1914), pp. 33–40*).—The nature of molasses is discussed. Maine standards and definitions are quoted and data given regarding the inspection, with analyses of a large number of samples.

Ice cream (*Maine Sta. Off. Insp. 57 (1914), pp. 13–20*).—Data are given regarding the examination of a large number of samples of ice cream and determinations reported of the milk fat present in cream used in the manufacture of ice cream.

Alum in foods (*U. S. Dept. Agr. Bul. 103 (1914), pp. 7*).—The results of the experimental studies carried on with healthy young men by R. H. Chittenden, A. E. Taylor, and J. H. Long, of the Referee Board of Consulting Scientific Experts, with respect to the use of alum in foods are briefly summarized. The aluminum was given in various forms and in some cases up to and exceeding 1 gm. per man per day.

The board report as follows:

"Aluminum compounds when used in the form of baking powders in foods have not been found to affect injuriously the nutritive value of such foods.

"Aluminum compounds when added to foods in the form of baking powders, in small quantities, have not been found to contribute any poisonous or other deleterious effect which may render the said food injurious to health. The same holds true for the amount of aluminum which may be included in the ordinary consumption of aluminum baking powders furnishing up to 150 mg. (2.31 grains) of aluminum daily.

"Aluminum compounds when added to foods in the form of baking powders, in large quantities, up to 200 mg. or more per day, may provoke mild catharsis. Very large quantities of aluminum taken with foods in the form of baking powders usually provoke catharsis. This action of aluminum baking powders is due to the sodium sulphate which results from the reaction.

"The aluminum itself has not been found to exert any deleterious action injurious to health, beyond the production of occasional colic when very large amounts have been ingested.

"When aluminum compounds are mixed or packed with a food, the quality or strength of said food has not been found to be thereby reduced, lowered, or injuriously affected."

Briefly stated, the decision reached by the board is that alum baking powders are no more harmful than any other baking powders, but that it is wise to be moderate in the use of foods that are leavened with baking powder.

In discussing the general question, A. E. Taylor states:

"'We must not, however, be oblivious to the fact that a saline cathartic residue results from the reaction of every form of known baking powder now commonly employed. The use of cream of tartar or tartaric-acid baking powder leaves in the alimentary tract a residue of tartrates which exhibit the action of a saline cathartic and of diuresis as well. The so-called phosphate baking powder leaves as a residue of reaction sodium phosphate, again a saline cathartic. And aluminum baking powder leaves as a residue of reaction sodium sulphate, a saline cathartic. Apparently therefore, at present at least, the use of baking powder is associated with the introduction into the alimentary tract of a certain

amount of saline cathartic, the salt differing with the use of the particular type of baking powder.'"

Is the use of saccharin and other artificial sweetening substances to be regarded as a sophistication or adulteration of foodstuffs? F. W. DAFERT (*Arch. Chem. u. Mikros., 7 (1913), No. 2, pp. 43–48*).—A summary and discussion of data.

The examination of miscellaneous foodstuffs, J. HECKMANN and H. KUTTENKEULER (*Ber. Chem. Untersuch. Amt. Elberfeld, 1912; abs. in Hyg. Rundschau, 24 (1914), No. 7, pp. 402, 403*).—Data are given regarding the examination of miscellaneous foods, condiments, and beverages, including among others chopped meat and sandwiches.

Household tests for the detection of adulterations in common foods, J. O. HALVERSON (*1911, pp. 28*).—In this pamphlet, issued by the Missouri State Department of Food and Drug Inspection, a number of simple methods for detecting adulterants are given.

A history of dietetics, LICHTENFELT (*Die Geschichte der Ernährung. Berlin, 1913, pp. XVII+365; rev. in Zentbl. Expt. Med., 5 (1914), No. 4, pp. 157, 158*).—As the reviewer points out, this volume contains a large amount of data regarding diet in prehistoric and in historic times. It also summarizes much data for and against a high protein diet.

Diet charts, J. C. TAYLOR (*London, 1911, pt. 1, 2 ed., charts 5; 1913, pt. 2, charts 5*).—This collection of diet schedules, designed for physicians' use, contains detachable charts which present classified lists of different types of foods. The physician can check those which he wishes to prescribe. Both sets of charts have to do particularly with diet in disease. In addition, the first set contains diet charts for nursing mothers and for infant feeding, and the second set charts for the feeding of school children.

The effects of school life upon the nutritive processes, health, and the composition of the blood, L. M. TERMAN (*Pop. Sci. Mo., 84 (1914), No. 3, pp. 257–264*).—A summary and digest of data.

The influence of nutrition and the influence of education in mental development, F. W. MOTT (*Sci. Prog. Twentieth Cent., 8 (1914), No. 31, pp. 460–481, pls. 2*).—The author discusses infant feeding, stimulus in relation to development of the brain, and other similar questions.

School breakfasts (*Mo. Bul. Ind. Bd. Health, 17 (1914), No. 2, p. 20*).—A brief statement is given regarding the character of breakfasts of 37 pupils in a public school in Indiana.

Notes on food and diet in Katanga, E. POPPE (*Bul. Soc. Chim. Belg., 27 (1913), No. 1, pp. 33–36*).—Typical food products are described and data given regarding the food habits and diet of Belgian Kongo natives.

The usual ration of laborers consists of 1 kg. bolted corn (maize) meal, 1.4 kg. unground corn, 0.14 kg. meat, and 14 gm. salt per day. The ordinary evening meal is composed of meat used for making soup and corn meal cooked in water. The cooking is very simple. The morning and midday meals consist of corn boiled or parched.

Analyses are reported of corn meal in common use and of a fermented beverage made from corn. Information is also given regarding food legislation and the nature and origin of food products imported.

Dishes and beverages of the old South, MARTHA MCCULLOCH-WILLIAMS (*New York, 1913, pp. 318*).—In this discussion of food and its preparation, directions for preparing many dishes are included, as well as data regarding kitchen equipment, living conditions, available food supply, and similar topics.

The art of home candy making (*Canton, Ohio, 1913, 3. rev. ed., pp. 110, figs. 24*).—Detailed directions are given for making candy at home, in most cases the sorts usually thought of as commercial candies.

Electric cooking, W. H. ALABASTER (*Elect. Rev., 73 (1913), pp. 451–454; abs. in Sci. Abs., Sect. B—Elect. Engin., 16 (1913), No. 192, p. 590*).—The author discusses and summarizes in tabular form data regarding the amount of energy required with electrical ovens of different makes to secure a temperature of 400° F. and maintain it for 1½ hours, and regarding the comparative efficiency of different sorts of hot plates when used to raise the temperature of 3 pints of water to boiling, as well as the weekly cost of cooking for a family of two adults and two children when different cooking devices are used.

Retail prices, 1890 to October, 1913, F. C. CROXTON (*U. S. Dept. Labor, Bur. Labor Statis. Bul. 138 (1914), pp. 160*).—This publication, which is No. 12 of the Retail Prices and Cost of Living Series, and a continuation of earlier work (E. S. R., 30, p. 364), contains a summary of data regarding the retail prices of food, coal, and gas, and the scaling weight of bread.

Further notes on dietetics, A. KAKOWSKI (*Ther. Monatsh., 27 (1913), No. 4, pp. 285–297; abs. in Hyg. Rundschau, 24 (1914), No. 4, p. 237*).—According to the author's experiments, eating fungi (*Boletus edulis*), even wholesome ones, has a harmful effect in parenchymatous nephritis.

The vitamins of food (*Nature [London], 93 (1914), No. 2315, pp. 41, 42*).—A summary of data included in a lecture entitled a Grain of Wheat, delivered by T. Johnson at the National Museum, Dublin, February 24, 1914. Rather sweeping deductions are drawn from recently published work regarding the occurence of vitamins in foodstuffs.

Amino acids in nutrition and growth, T. B. OSBORNE, L. B. MENDEL, ET AL. (*Jour. Biol. Chem., 17 (1914), No. 3, pp. 325–349, figs. 8*).—In their introduction to the report of their experimental work the authors point out the necessity for adding to and systematizing knowledge regarding the protein "building stones" formed by the complete hydrolysis of the protein molecule. From theoretical considerations and experimental data they discuss the necessity for adding the lacking "building stones" to a deficient protein, which the body can not synthesize except from its own tissue.

Distinction is made between maintenance and growth from a theoretical as well as from an experimental standpoint. The necessity for a certain amount of maintenance protein to make good wear and tear is discussed and other theoretical considerations suggested. The body may maintain itself, as the authors point out, on a kind of protein on which it can not make growth. Therefore, growth, which involves the actual formation of protein substance, makes a different kind of demand from maintenance only. For instance, the authors have found gliadin sufficient to supply the nitrogenous material required for maintenance over long periods of growth (E. S. R., 28, p. 864). However, gliadin would not suffice, as the sole protein, for growth, this and other experiments being facilitated by the addition to the diet of butter fat (E. S. R., 30, p. 560). In more recent work with laboratory animals (rats) the authors have succeeded in promoting growth at a normal rate when a maintenance ration containing gliadin as the sole protein was supplemented with lysin.

The authors believe that their feeding trials, in conjunction with their "demonstration of the almost complete cessation of growth on diets containing only lysin-free proteins, furnish the first and only conclusive demonstration that lysin is indispensable for the functions of growth. They are supplemented by further evidence of the same sort in which the necessity for the same amino acid is brought out in connection with the zein of maize [see below], a protein likewise devoid of lysin. . . .

"The facts here established make it clear that, at least in so far as nutrition in growth is concerned, the normal construction of new tissues is limited by the factor of the supply of lysin. In the light of this, little is gained by emphasizing the quantitative aspects of the protein needs in growth . . . , unless the qualitative character of the protein available is kept clearly in mind. No amount of energy or protein, however abundant, has induced growth of our animals in the absence of lysin. The animal organism apparently can not synthesize lysin, which is evidently not essential for maintenance in the sense of preservation of body weight, though it is, of course, impossible to say that when this amino acid is missing all functions are normally carred out. That the tissues either form a typical protoplasmic product, or none at all, now seems to be axiomatic in physiology. We may therefore reasonably assume that the growth of rats on our gliadin+lysin food represents the construction of typical tissue substance. It is obvious, furthermore, that the possibility of growth must be limited, among other things, by the amount of lysin available."

The following data are brought together regarding the percentage of lysin in proteins of different sorts, both animal and vegetable: Lactalbumin 8.10, halibut muscle 7.45, ox muscle 7.59, casein (cow's milk) 7.61, vitellin (egg yolk) 4.81, crystallized albumin (hen's egg) 3.76, legumin (pea) 4.98, phaseolin (kidney bean) 4.58, glutelin (maize) 2.93, glutenin (wheat) 1.92, edestin (hemp seed) 1.65, amandin (almond) 0.72, gliadin (wheat) 0.16, and hordein (barley) and zein (maize) none.

"It is a teleologically interesting fact brought out by the foregoing figures that those proteins, like casein, lactalbumin, and egg vitellin, which are in nature concerned with the growth of animals, all show a relatively high content of lysin."

In further proof of their contention that lysin is indispensable, the authors cite experiments with zein, which, like gliadin, is devoid of lysin as well as gylcocoll and tryptophan. Their experiments have shown that when zein is the sole protein fed to both adult and growing rats, a decline is always noted. When a trytophan or a tryptophan-yielding protein is supplied, maintenance is possible for a long period.

"The relative efficiency of different proteins in preventing the failure with zein apparently depends to a dominant degree, in so far as maintenance is concerned, on their comparative yield of tryptophan.

"Where growth is involved in addition to maintenance, the lysin factor as well as others not yet more accurately ascertained must also be taken into account. Here, then, is evidence of the relative economy of different proteins in maintenance, based upon the content of one or more of the amino acids essential for the proper functioning of the organism (in so-called maintenance) or for new tissue construction (in growth). Obviously the relative values of the different proteins in nutrition are based upon their content of those special amino acids which can not be synthesized in the animal body and which are indispensable for certain distinct, as yet not clearly defined processes, which we express as maintenance or repair. . . .

"With the indispensability of tryptophan for maintenance, and of lysin for growth, thus emphasized, we may expect that the addition of both of these amino acids to zein food will result in growth. This expectation has been fulfilled by the experiments planned. . . . The respective parts played by the two amino acids are here clearly brought out. These are, we believe, the first successful attempts to grow animals on a diet in which zein forms the sole protein." When comparison is made with results of the experiments showing the relative effect of replacing one-fourth of the zein with lactalbumin,

casein, and edestin, respectively, it will be seen that "this small addition of lactalbumin has furnished all the factors required for normal growth. This protein mixture therefore undoubtedly contains sufficient tryptophan and lysin to satisfy the normal requirements of the growing animal. Since casein yields nearly as much lysin as does lactalbumin, we assumed that the failure of an equal addition of casein was due to a relative deficiency in tryptophan." That this assumption was true was shown by experimental evidence. "Similarly we assumed that the failure to grow on the comparable zein+edestin food was caused by the relatively small amount of lysin yielded by edestin."

Here, too, the experimental evidence showed the correctness of the assumption. "These experiments are further of chemical interest in indicating, as the result of this biological test, that edestin is richer in tryptophan than casein—a fact hitherto unappreciated.

"The growth of rats on a food of zein+lysin+tryptophan has not always been as rapid and prolonged as we might expect. We are by no means prepared to maintain that the final solution of the proportion of amino acids requisite for the growth of rats has been determined. Newer trials may indicate the desirability of increasing the proportion of arginin present in zein foods; and still other adjustments may be required to promote ideal growth in this or different species. The way to successful investigation has been opened."

The influence of cod liver oil and some other fats on growth, T. B. OSBORNE, L. B. MENDEL, ET AL. (*Jour. Biol. Chem., 17 (1914), No. 3, pp. 401–408, figs. 4*).—The inability of laboratory animals (young albino rats) to complete their growth on a diet consisting of isolated proteins, starch, protein-free milk, and commercial lard, called attention to the need for supplying some other substances in order that growth might proceed to its normal limits.

As was pointed out in earlier experiments (E. S. R., 30, p. 560), the lacking factor was found in the fat component of milk, a conclusion substantiated by later investigations. A ration consisting of 18 per cent purified protein, 26 per cent starch, 28 per cent protein-free milk, 10 per cent commercial lard, and 18 per cent butter fat, the authors state, appears to be in every way adequate for the continued nutritive needs of the species experimented with. Some other fats have been found to behave like butter fat in this respect—for instance, egg yolk fat (E. S. R., 29, p. 664). The authors state that they have likewise obtained uniform success when cod liver oil was substituted for a portion of the lard in the standard diets. On the other hand, it was observed that almond oil uniformly failed to restore growth when it had ceased on the usual lard-food mixtures.

"We have already pointed out that it seems improbable that the triglycerids of the fatty acids ordinarily present in foods are responsible for the favorable effects noted. If they were, there is no apparent reason why such fats as commercial lard and almond oil should be ineffective. Experiments as yet incompleted have made it clear that the growth-promoting substance is not present in the more solid fractions of butter fat which constitute about one-half of it and are at least soluble in alcohol at low temperatures.

"It is perhaps more than a mere coincidence that cod liver oil has so long enjoyed a reputation for nutritive virtues which can scarcely be attributed to its fat content per se. At one time its therapeutic value was ascribed to the small proportion of iodin which it is known to contain. This explanation has, of late, been replaced by the suggestion that the special potency of cod liver oil resides in the peculiar fatty acids which it contains. . . .

"Perhaps experiences such as have been reported in this paper will pave the way for a clearer understanding of the physiological potency of natural

products like butter, egg yolk, and cod liver oil, which have long enjoyed a popular, yet inexplicable, reputation for unique nutritive potency."

The cleavage of fatty acids in the animal body, M. KOPPEL (*Über den Abbau der Fettsäuren im Tierkörper. Inaug. Diss., Univ. Strassburg, 1913, pp. 42; abs. in Zentbl. Biochem. u. Biophys., 16 (1914), No. 11–12, p. 366*).—The author has studied the cleavage of saturated, aliphatic acids of the acetic acid series with a view to determining the first step in the oxidation of fatty acids.

Influence of phytin on the elimination of nitrogenous compounds in normal individuals, F. VENTURI and V. MASSELLA (*Arch. Farmacol. Sper. e Sci. Aff., 16 (1913), No. 3, pp. 97–118*).—Experimental data are given which demonstrate that the ingestion of from 1.5 to 2 gm. of phytin per day results in a marked decrease in the elimination of urea, creatinin, hippuric acid, and other unidentified nitrogen compounds in the urine, as well as in a decrease in the loss of nitrogen in the feces. Little or no effect was observed upon the elimination of uric acid and ammonia. At the end of the period during which phytin was ingested a nitrogen balance four or five times greater than that observed during the preliminary period was noted.

Minimum requirement of alimentary carbohydrates, R. LAUFER (*Bul. Gén. Thér. Méd. et Chirurg., 165 (1913), No. 5, pp. 176–183; Zentbl. Biochem. u. Biophys., 15 (1913), No. 4–5, p. 149*).—The results are reported of experiments carried out at 16° C. with two subjects who were given a daily carbohydrate ration of from 290 to 300 gm.

In the opinion of the author, these results show that there is a certain minimum amount of carbohydrate which the body requires. Unless this minimum amount is supplied the carbohydrate can not be replaced by its equivalent isothermal value of protein or fat. For example, in the absence of this minimum requirement in the diet 1 gm. of fat would develop only 6.8 calories instead of 9.1 calories. It is pointed out that in pathological conditions this minimum requirement of carbohydrate should be supplied in the diet both to prevent a loss of heat value and to prevent the overworking of the organs.

From a study of the data here given, the author concludes that with a diet containing not less than 219 gm. of carbohydrate per day the body weight does not decrease. For a 70 kg. subject at rest the minimum daily requirement of carbohydrate is probably that which would furnish from 900 to 1,000 calories. [This must, of course, presuppose an adequate supply of nitrogen in the diet also.]

Experiments on the carbon dioxid excretion with different kinds of muscular work, G. BECKER and J. W. HÄMÄLÄINEN (*Skand. Arch. Physiol., 31 (1914), No. 1–3, pp. 198–240, fig. 1*).—In these experiments, which were made with men and women engaged in different kinds of labor, the Tigerstedt respiration apparatus was used.

The work periods were of two hours' duration, and in every case were compared with similar periods in which the subjects were at rest. The men were engaged in shoemaking, tailoring, bookbinding, metal working, painting, carpentry, stone-masonry, or wood sawing, and the women in hand sewing, machine sewing, laundering, domestic service (cleaning windows and floors and washing and polishing dishes, etc.), or bookbinding.

From the excretion of carbon dioxid the respiratory carbon output was calculated and found to vary between 6.68 and 10.12 gm. per hour for the men, and 5.50 and 6.83 gm. for the women in the rest periods, and between 11.23 and 45.5 gm. per hour in the case of the men, and between 7.5 and 25.91 gm. per hour in the case of the women in the work periods.

The authors conclude that work may be called light or moderate when the respiratory excretion of carbon is not greater than 16 gm. per hour. This would be the case with the work of tailors, bookbinders, and shoemakers. When the respiratory carbon excretion is from 16 to 30 gm. per hour the work is designated as severe. To this group would belong metal workers, painters, or carpenters. When the respiratory carbon excretion exceeds 30 gm. per hour the work is called very severe. To this group would belong stone masons and wood sawyers. In the case of the women sewing either by hand (7.5 to 8 gm. carbon per hour) or by machine (9.35 to 10.78 gm. carbon per hour) is regarded as relatively light work, much the same as that of a bookbinder (8.88 to 11.5 gm. carbon in respiratory products per hour). The authors are of the opinion that women's work can be called light when it does not cause a respiratory excretion of more than 20 gm. per hour. The respiratory excretion in the case of the laundresses was 16.91 and 25.91 gm. per hour on an average. In the case of the two subjects engaged in housework it was 13.01 and 20.7 gm. per hour on an average.

From the amounts of respiratory carbon excreted per hour and the energy required by the body for maintenance, the authors compute the energy expenditures for the work alone in the different experiments. These are found to range from 44 calories per hour with the tailors to 406 calories per hour with the wood sawyer, and in the case of the women from 4 calories per hour with one of the women engaged in sewing by hand to 214 calories in the case of the woman engaged in laundry work. The computed amount of work in an 8-hour day ranged from 29,920 kgm. with the tailors to 276,080 kgm. with one of the subjects sawing wood, and in the case of the women from 16,320 kgm. in the case of one of the women working with a sewing machine to 106,760 kgm. with one of the women engaged in housework. The seamstresses engaged in handwork were not included in this calculation, but would differ little from those who worked with the machine.

The general deduction is that men engaged in light or moderate muscular work produce up to 60,000 kgm.; in severe work up to 160,000 kgm.; and in very severe work up to 280,000 kgm. and more. In the case of women, the expenditure in light or moderate work is up to 40,000 kgm.: in severe work up to 100,000 kgm.; and in very severe work up to 145,000 kgm. and more. The total energy production per day as calculated, ranging from 2,600 to 6,000 calories, was very much the same as the energy supplied in the diet (2,300 to 6,300 calories). The authors note that the energy supplied in the experimental diet was somewhat smaller than it should have been in the case of shoemakers, tailors, and metal workers, but they are of the opinion that rather more work was done in the calorimeter chamber than would be under ordinary circumstances. In the case of the carpenter and the wood sawyer the energy supplied in the experimental diet was very close to the energy production.

Since the energy supplied in the diet in these experiments was in accord with the requirements as expressed by the usual dietary standards, they believe that these are reasonable with respect to the energy which should be provided for persons engaged in muscular work.

The relation between gaseous exchange and surface area at extreme temperatures, E. Götsch (*Über die Beziehungen des Respiratorischen Stoffwechsels zur Körperoberfläche bei Extremen Aussentemperaturen. Inaug. Diss., Univ. Leipsic, 1912, pp. 42, figs. 3; Arch. Anat. u. Physiol., Physiol. Abt., No. 5–6 (1912), pp. 421–459, figs. 3*).—A small respiration apparatus was used for these experiments with laboratory animals (guinea pigs).

According to the author's conclusion, Rubner's rule that the carbon dioxid production at constant temperature is proportionate to the surface area has a

limited application in the case of extreme temperatures. In general, the heat regulation is less efficient with small animals at low temperature than with large animals at high temperature.

An increased rectal temperature in childhood, E. Moro (*Monatsschr. Kinderheilk., 11 (1913), No. 9, pp. 430–438; abs. in Zentbl. Physiol., 27 (1913), No. 22, p. 1185*).—The author found that even in normal children the rectal body temperature was usually increased after exercise with the legs and lower part of the body. As shown by measurements, the axilla temperature would not be so raised. If the work was done with the arms and upper part of the body, the increased temperature was noted in the axilla and not in the rectum.

The effects of light upon metabolism, L. Pincussohn (*Berlin. Klin. Wchnschr., 50 (1913), No. 22, pp. 1008, 1009; abs. in Zentbl. Physiol., 27 (1913), No. 24, p. 1309*).—In experiments with laboratory animals (white dogs) it was found that in the light period (arc light, 500 candlepower) the excretion of allantoin was much diminished, while the urea excretion remained unchanged. Oxalic acid excretion was increased.

ANIMAL PRODUCTION.

Principles of feeding, O. Kellner (*Grundzüge der Fütterungslehre. Berlin, 1912, 4. ed., rev. and enl., pp. VII+231*).—This edition of this book treats of the general principles involved in the feeding of farm animals, the composition, digestibility, and value of feeding stuffs, the characteristics of various feeding stuffs, and their preparation, conservation, and economical use.

The nutritive values of organic and inorganic phosphorus, E. B. Forbes (*Proc. Soc. Prom. Agr. Sci., 34 (1913), pp. 23–32*).—This paper treats of the nutritive limitations imposed by the differences in the chemical relationships of phosphoric acid in feeds. It is the purpose to determine whether organic and inorganic phosphorus compounds can serve equally well all of the requirements of the body for phosphorus under all conditions of life.

After citing the results of previous investigators and of work conducted by the author, it is concluded that "the character of the evidence does not warrant final conclusions in regard to this problem. We are unable to say whether the lack of harmony in results with dogs, rats, and mice is due to differences in the nutritive processes of these animals or to differences in the purity of the organic phosphorus compounds used, or to ill-considered or incomplete experimental methods. . . . The problem now seems to take the form of a question as to whether we shall regard organic phosphorus compounds as of superior nutritive value because of the chemical relationship of their phosphoric acid or because of the presence of other unknown substances of value associated with them in natural feeds."

A bibliography of 36 references is appended.

Fish meal, E. Haselhoff (*Fühling's Landw. Ztg., 63 (1914), No. 4, pp. 137–143*).—Experiments conducted at the experiment station at Harleshausen indicate that, providing it is of good quality, fish meal forms a desirable supplementary feeding stuff for farm animals, especially for pigs. Fish meal is produced from fish offal and condemned whole fish. Owing to the varied nature of its raw material and its methods of preparation, fish meal varies very widely in its composition as shown by the following analyses: Water from 5.9 to 18.91 per cent, crude protein 38.83 to 58.96, digestible protein 30.43 to 54.52, fat 1.55 to 14.03, phosphate of lime 7.8 to 36.16, salt 0.7 to 20.1, ash 20.53 to 45.07, and sand 0.1 to 6.05 per cent.

It is said that if fed in too large quantities or containing too high a percentage of oil the meal is liable to give a fishy taste to the meat product, but

meal containing from 2 to 4 per cent of oil may be safely fed. Salt should not exceed 3 per cent. The phosphate of lime found in fish meal is deemed a valuable adjunct in feeding animals.

It is suggested that the following amounts may be given daily if the meal is of good quality: Cattle 2 lbs. for every 1,000 lbs. live weight, pigs from ¼ to ½ lb. per head according to weight, and sheep from $\frac{1}{16}$ to $\frac{1}{8}$ lb. for every 100 lbs. live weight.

[Feeding stuffs] (*Maine Sta. Off. Insp. 60 (1914), pp. 41–88*).—Analyses are reported of the following feeding stuffs: Cotton-seed meal and feed, gluten meal and feed, linseed meal, distillers' grains, red dog flour, wheat middlings, bran, and offals, and various mixed and proprietary feeds.

Origin of our important domestic animals, H. W. Behm (*Zool. Beob., 55 (1914), Nos. 2, pp. 33–40, figs. 2; 3, pp. 65–71, figs. 5*).—This is a general article treating of the origin and distribution of our common breeds of cattle, sheep, goats, horses, and swine.

Effects of inbreeding, H. Kraemer (*Jour. Heredity, 5 (1914), No. 5, pp. 226–234*).—In this article the author reviews the theories advanced by Darwin and others with regard to the effects of inbreeding in animals and points out the wide diversity of opinion held by these investigators. He concludes that "continued inbreeding always must result in weakened constitution, through its own influence."

The determination of sex, P. J. Wester (*Jour. Heredity, 5 (1914), No. 5, pp. 207, 208*).—The author reviews the investigations of T. Ciesielski in Lemburg with plants and animals on the determination of sex. Numerous experiments were conducted with rabbits, dogs, horses, and cattle, a large number of which, it is stated, served to verify previous studies with plants. It is concluded that the sex of the progeny is governed by the condition of fecundation and that sex in animals is determined by the age of the spermatozoa at the time they unite with the ova.

An editorial note appended calls attention to the fact that it is now believed by many investigators that the determination of sex depends on the inheritance of a Mendelian factor differentiating the sexes, and that microscopical studies of the cell indicate that the presence of an accessory or "x" chromosome in the sperm or egg (usually the latter) is the deciding factor in some species.

The problem of the meat supply (*Chamber Com. U. S. A., Gen. Ser., Bul. 88 (1914), pp. 230–237, figs. 6*).—This relates to the present situation with regard to meat supply in the United States, causes of decrease, import and export statistics, domestic and foreign sources, and suggestions as to the problem of adjustment of conditions in the near future.

Australia and New Zealand as sources of meat supply, A. W. Pearse (*Proc. Amer. Warehousemen's Assoc., 23 (1913), pp. 213–219*).—Data are given on the relative importance of these countries in supplying frozen meat to the United States and other countries.

The amount of bone in animals for the slaughterhouse, Tridon (*Hyg. Viande et Lait, 8 (1914), No. 1, pp. 18–22; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 3, pp. 404–406*).—Investigations made on calves and sheep indicate that the proportion of bone to the total weight of the animal varies inversely with the age, the quality, and the weight of the animal. The proportion of bone was found to be very variable and the weight of bone reaches and sometimes exceeds one-third of the total weight of the animal.

A comparison between the fat stock and the carcasses exhibited at Smithfield Show, J. Long (*Jour. Bd. Agr. [London], 21 (1914), No. 1, pp.

1–12).—Results obtained with cattle, sheep, and hogs at the Smithfield Show indicated that there is a difference of but 409 lbs. in live weight and 266 lbs. in carcass weight between 2 and 3 year old fat steers. This suggests that it can not pay the feeder to retain a steer for the additional year involved, since the actual weight of beef produced would barely exceed 5 lbs. a week. In the classes for heifers similar results were obtained, showing the economical value of early maturity. Likewise with sheep and hogs it is seen that in the open classes these are fattened too much without any corresponding advantage, while those which are fitted for the carcass competition realize higher prices.

It is concluded from these observations that breeders and feeders will obtain better results by finishing their fattening cattle as early as possible and by avoiding excessive fatness in general.

The cattle industry in Britain, R. Wallace and J. A. S. Watson (*Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 3, pp. 306–312, figs. 2*).—The authors trace the development of the cattle industry in Britain since 1878. It is shown that whereas the number of "cows or heifers in milk or in calf" has remained fairly constant, varying between 35.7 and 37.3 per cent, the number of "other cattle two years old or over" has fairly steadily decreased from 24 per cent in 1893 to just under 20 per cent in 1912, with a corresponding increase in the proportion of yearling cattle and calves. There appears to have been a long-continued tendency to market cattle for slaughter at a diminishing age. With regard to available supplies of feed for cattle, there has been a considerable decrease in the root crop in the past 35 years, and an increase in the total area of pasture and hay up till about 10 years ago, since when it has shown a decrease and a very great increase in imports of cakes and meals, etc.

During the five years, 1906–1910, inclusive, the annual exportation of pedigreed breeding cattle from Great Britain averaged 3,097 head and the average value about £60. The United States took about 32 per cent and Argentina and Uruguay about 30 per cent of the total exports. The Shorthorn breed is most numerously represented in the exports. It is stated that at the present time one of the main features of the cattle industry of Britain is the scarcity of feeder cattle, with consequent high price for such stock and a diminution in the profits of feeding.

Attention is called to the increased importance of the dairy industry. British methods of feeding and fattening are discussed.

The cattle of the valleys of Saint-Girons and Aure, A. Guy (*Vie Agr. et Rurale, 3 (1914), No. 20, pp. 545–549, figs. 5*).—An account of the breed characteristics, utility value, and improvement of the local breeds of cattle of the valleys of Saint-Girons and Aure.

Cattle of Ruanda, K. Sommerfeld (*Tropenpflanzer, 18 (1914), No. 4, pp. 177–201, figs. 5*).—This article treats of the weights, measurements, and breed characteristics of several types of cattle in Ruanda, German East Africa.

Variation in the tongue color of Jersey cattle, R. Pearl (*Proc. Soc. Prom. Agr. Sci., 34 (1913), pp. 49–57*).—The results of studies made of the recorded tongue color of 6,917 registered Jersey cattle in the herd register for 1893 and of 7,450 cattle in that of 1913 indicate that at the present time something over 75 per cent of registered Jersey cattle have black tongues; that in the last 20 years the proportion of black-tongued individuals has increased slightly, in males about 1 per cent and in females nearly 4 per cent; and that a higher proportion of males than of females have black tongues, though the difference was somewhat larger 20 years ago than now. The cause of these relations between the sexes is attributed to the influence of "fashion" in tongue color in the Jersey breed. It is thought that "more pigmented tongues are actually

being produced now, fundamentally for the reason that there are more black-tongue genes in the general Jersey population than there were then [1893]."

Distributing the very small percentage (0.6 per cent) of spotted-tongue individuals found in the 1893 studies equally between the two classes, pigmented and unpigmented, it was found that the ratio of the one to the other was very close to 3:1, which suggests a "simple case of Mendelian inheritance, in which pigmented tongue is the dominant character and nonpigmented the recessive." Further studies indicate that "tongue color hereditarily depends upon two separate factors which show partial coupling on a 3:1:1:3 basis." It is stated that a detailed discussion of the data regarding inheritance of the characters will be published later.

Calf-rearing experiment, J. A. VOELCKER (*Roy. Agr. Soc. England, Rpt. Calf-Rearing Expt., 1912–13, pp. 7*).—Five lots of four Shorthorn bull calves each, three weeks old, were fed for nine weeks as follows: Lot 1, cod liver oil and separated milk; lot 2, a proprietary "calf meal" and whole and separated milk; lot 3, gruel (linseed and oatmeal) with separated milk; lot 4, whole milk; and lot 5, crushed oats and separated milk. Lot 1 gained 9.66 lbs. per calf per week at a cost of 3.33d. per pound gain in live weight; lot 2, 8.66 lbs. at 2.77d.; lot 3, 8.33 lbs. at 3.45d.; lot 4, 12.83 lbs. at 5.39d.; and lot 5, 13.3 lbs. at 2.52d.

This experiment was followed with further grain and pasture feeding for seven months in which all calves were fed alike. Those calves which had received crushed oats and separated milk continued to gain faster than the other lots. It is concluded from this that the influence of early feeding of calves has an important bearing on their after development and that a good start is very essential. The next best results were obtained from the whole-milk fed calves, which lot had the most "bloom" of any of the lots. The poorest of all was the calf-meal lot.

The domestic buffalo, L. GRANATO (*Bol. Agr. [Sao Paulo], 14. ser., 1913, Nos. 8, pp. 471–514, figs. 13; 9, pp. 559–625, figs. 20*).—This is a study of the morphological characteristics of the domestic buffalo and a comparison with those of domestic cattle. Items included are cranium measurements, character of tongue, dental system, capacity and character of stomach, duration of digestive process, respiratory, circulatory, urinary, and genital systems, and body characteristics.

Other subjects discussed are the relation of dental system to age, growth and character of horns in relation to age, geographical distribution, milk and meat production, and the physical and chemical characteristis of buffalo milk.

Crossing bison and cattle, M. M. BOYD (*Jour. Heredity, 5 (1914), No. 5, pp. 189–197, figs. 6*).—The author's experience in crossing bison and cattle indicates that the bison furring characteristics are retained equally well in the one-half, three-eighth, and one-quarter cattalo. It is thought that the one-quarter cattalo has somewhat the best coat of the three. From these observations it is believed that later generations having 10 per cent or less of bison blood will have as good fur as is now seen on the one-half and three-quarter buffaloes. The opportunities for improving the beef carcass through this cross are also pointed out.

It is stated that the most remarkable and most disastrous feature of the first cross was the abnormal secretion of the amniotic fluid which was excited without exception in every cow, and which proved fatal in a large percentage of cases. However, no trouble has been experienced in the second and third crossings.

It is concluded that "it does not seem unreasonable, therefore, to suggest that the fur of the bison and his great back may be carried by means of selec-

tion without any diminution through succeeding generations of diminishing bison blood until the coat and hump have been practically taken from the bison and placed upon the back of the domestic ox."

My experience with bison hybrids, C. GOODNIGHT (*Jour. Heredity, 5 (1914), No. 5, pp. 197–199, fig. 1*).—The author summarizes his experience in crossing Texas buffaloes with native cattle.

It is stated that no male calves have been born from the cross; cows conceiving them either suffer abortion or die. The heifer hybrids breed readily to either the buffalo or the cattle. When bred to the buffalo, the males, which are three-quarter, are not fertile. The females are perfectly fertile and will breed to either race. They are then bred back to the polled Angus stock from which they came, with resulting males which are fertile and are half-breeds.

Advantages claimed for these hybrids, or cattaloes, are immunity from diseases, especially Texas blackleg and Texas fever. The cattaloes are much "greater in weight, eat much less, and hold their flesh better under more adverse conditions. They will easily cut about 70 per cent net of their gross weight. They have a better meat, clear of fiber, and it never gets tough like beef. They have long and deep backs, enabling them to cut at least 150 lbs. more meat than other cattle. More of them can be grazed on a given area. They do not run from heel flies nor drift in storms, but, like the buffalo, face the blizzards. They rise on their fore feet instead of their hind feet. This enables them to rise when in a weakened condition. They never lie down with their backs downhill, so they are able to rise quickly and easily. This habit is reversed in cattle. . . .

"The buffaloes have fourteen ribs, giving them a longer and deeper lion. As we get them higher and deeper in the buffalo we get the extra rib on the 'cattalo.' They can exist on less feed or salt than cattle. . . . They could do without water much longer than cattle, without inconvenience. They are docile, easily broken, and never fight. They put on flesh faster than any cattle and will live and appear to do well where cattle will perish."

Domestic breeds of sheep in America, E. L. SHAW and L. L. HELLER (*U. S. Dept. Agr. Bul. 94 (1914), pp. 59, pls. 28, fig. 1*).—This bulletin gives detailed information as to the origin, adaptability, distribution, and distinguishing characteristics of the various domestic breeds of sheep. Tables showing the probable origin of the breeds of sheep in America, and giving the breeding of grand champions, reserve champions, and winners in the carcass contests at the International Live Stock Exposition, and a short bibliography are appended.

Caracul sheep farming, M. KARPOV (*Agr. Jour. Union So. Africa, 6 (1913), Nos. 5, pp. 760–766; 6, pp. 939–944; 7 (1914), Nos. 1, pp. 93–95; 2, pp. 199–206; 3, pp. 398–407*).—This article, which is translated from the Russian, relates to the environments, breed characteristics, and management of this breed of sheep, and to the grades and quality of caracul fur.

Heredity studies with swine, G. FRÖLICH (*Jour. Landw., 61 (1913), No. 3, pp. 217–235, pls. 2*).—In reviewing observations made in Germany and the United States on the heredity of coat color in swine, the author concludes that in the F_1 generation of crosses the following are dominant: White of improved German swine over white and black of Hanoverians, black of Berkshires, grayish-black of European wild pigs and of Cornwalls, red of Tamworths, or black of Caucasian wild pigs; grayish-black of European wild pigs over red of Tamworths; and black and white or Hampshire over red of Tamworths.

Carcass tests conducted on Lincoln and Mangalicza pigs in Hungary, O. WELLMANN (*Köztelek [Budapest], 23 (1913), No. 97, pp. 3272–3275; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 3, p. 382*).—With the purpose of improving the curly coated Mangalicza

pigs of Hungary in prolificacy and early maturity the breed was crossed with the English Lincoln curly coated breed. Among pigs fattened for five months the dead weight of Lincoln×Mangalicza pigs at 14 months was the same as that of the pure-bred Mangalicza pigs at 26 months. The dead weight of all the animals amounted to from 82 to 88 per cent of the live weight.

Pig feeding, F. C. GRACE (*Jour. Dept. Agr. Victoria, 12 (1914), No. 1, pp. 44–50; abs. in Jour. Bd. Agr. [London], 21 (1914), No. 1, pp. 59, 60*).—General conclusions drawn from pig feeding experiments conducted in Victoria are that "the younger the pig, the cheaper is the gain per pound; that pollards and milk, with a little bran, is one of the cheapest rations to feed to pigs of all ages; that rape pasture is likely materially to reduce the cost of production; that with well-bred pigs, properly fed and cared for, first grade pork and bacon can be produced in Victoria for about 1¾d. per pound live weight or under 2¼d. per pound dressed weight; and that an average weekly gain of about 8 lbs. should be expected, and the pig put on the market at from 180 to 200 lbs. live weight within 6 months."

Alfalfa and hogs, C. A. NORCROSS (*Nev. Bur. Indus., Agr. and Irrig. Bul. 7 (1912), pp. 7–4, figs. 18*).—This is a popular treatise on the feeding, care, and management of hogs in Nevada, with special reference to the feeding of alfalfa pasture and hay.

A pork production contest, T. P. COOPER (*Breeder's Gaz., 65 (1914), No. 10, pp. 523, 524*).—This reports a pork production contest conducted under the management of the Better Farming Association of North Dakota. The first prize was awarded to the owner of a large Yorkshire sow which produced a litter of pigs weighing 2,903 lbs. after 203 days at a feed cost of 2.87 cts. per pound. The profit on the cost of feed with pork at 6 cts. was $91.06 for the litter. A Poland China sow produced a litter weighing 2,098 lbs. in 218 days at a cost of 1.7 cts. per pound.

In this contest house slops constituted a portion of the feed but were not considered in the cost of production. The average number of pigs born in the litter was 8.2 and the average number saved and raised, 7.5 pigs per litter. In general more economical gains were made with pure-bred stock than with crossbred.

Experiments on pig fattening in Prussia with automatic feeder or common trough, DE LA BARRE (*Landbote [Prenzlau], 34 (1913), Beilage: Tierzuchtnachrichten, 6 (1913), No. 8, pp. 114–117; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1913), No. 11, pp. 1751–1753*):—The results of experiments conducted with 8-weeks-old pigs for 22 weeks indicated that from an economic point of view there is not much difference between the use of the automatic feeder and that of the common trough.

Our domestic birds, J. H. ROBINSON (*New York, Chicago, and London, 1913, pp. X+317, pl. 1, figs. 236*).—This is a general text-book treating of the feed, care, and management of poultry and domestic fowls.

Poultry management, C. K. MCCLELLAND (*Hawaii Sta. Press Bul. 46 (1914), pp. 54, figs. 4*).—This deals with the housing, breeding, feed, care, and management of poultry and poultry diseases and pests, with especial reference to Hawaiian conditions, and replaces Bulletin 1 (E. S. R., 13, p. 898).

The Garonnaise breed of chickens, J. GIRARD (*Vie Agr. et Rurale, 3 (1914), No. 20, pp. 550–553, figs. 4*).—An account of the habitat, breed characteristics, and utility value of the Garonnaise breed of chickens.

The ash and protein factor in poultry feeding, H. R. LEWIS (*New Jersey Stas. Bul. 265 (1913), pp. 5–76, figs. 37*).—Three extensive series of experiments carried on at the station as to the relation of ash and protein to broiler pro-

duction, rearing of pullets, and egg production, are summarized by the author, as follows:

Protein from a vegetable source, even when accompanied by a high phosphoric acid content in the ration, is not an efficient method of providing protein when feeding growing chickens or laying flocks. The addition of animal protein in the form of meat scrap materially increases the efficiency of a ration relatively high in vegetable protein, both for egg production and for flesh growth. An increased consumption of nitrogen, occasioned by the addition of meat scrap, does not cause increased loss of nitrogen in the droppings, the reverse, however, being true.

Phosphoric acid from an organic source (animal bone) is much more efficient than phosphoric acid from an inorganic source, as phosphate rock. Lime in itself has little or no effect upon increasing assimilation of nitrogen. Lime from bone is not as easily assimilated as lime from phosphate rock. This was verified in every instance, and the difference was very pronounced. From the standpoint of broiler production, from the standpoint of maturity, and from the standpoint of egg production, meat scrap is a necessary adjunct to any ration. Dry granulated bone was found to be a cheaper source of phosphoric acid and protein than a prepared commercial product, and was more efficient in poultry feeding.

Laying hens fed a ration deficient in protein not only give a low production but the eggs which are produced are small and undersized. A dry mash containing considerable variety and having 20 per cent by weight of beef scrap, is an efficient foundation for a laying ration. For growing chicks a dry mash, having for its base wheat bran and containing by weight at least 10 per cent of meat scrap and 10 per cent of granulated bone, is an efficient ration.

Analyses of the foods used are reported, and a number of practical working rations are appended.

The breeding of egg-laying poultry, J. WILSON (*Dept. Agr. and Tech. Instr. Ireland Jour., 14 (1914), No. 2, pp. 231–240*).—The author reviews the studies of Pearl on the inheritance of egg laying in poultry (E. S. R., 28, p. 576).

In addition, data are given on the results of an egg-laying competition at the Munster Institute, Cork, 1912–13, when it was found that a hen's total yield for the year could be predicted approximately from her yield a few weeks after she had begun to lay. The record of 24 hens is given, 8 very good, 8 medium, and 8 poor layers. It is pointed out that the good layers have blanks of only 1 day at a time, as a rule, and that this rate is kept up for 8 or 10 weeks at least; that the medium layers have blanks of several days at a time, or if not, lay for a few weeks only; and that poor layers lay no eggs at all, or only a very few. It is stated that "the great value of the observation lies in this, that the breeder knows before the setting season begins the grades to which his pullets belong and he can infer therefrom the parents' grades in some cases."

Factors influencing the size, shape, and physical constitution of the egg of the domestic fowl, MAYNIE R. CURTIS (*Maine Sta. Bul. 228 (1914), pp. 105–136*).—This paper is an analysis of the normal variations in the size, shape, and physical constitution of the eggs of the domestic fowl as determined by observations made of all of the eggs laid by 22 Barred Plymouth Rock birds during their first two laying years.

With regard to the individuality of the eggs of the same bird it was found that the "individuality of a bird is expressed in each physical character of her eggs. This individuality is more pronounced in respect to the size than the

shape of eggs and also in respect to the weight of albumin and shell than weight of yolk. There is a tendency for the several egg characters to be related to each other in such a way that when the eggs of an individual are large they are both long and broad and each of the parts is large; but the hens which lay large eggs lay eggs with a smaller proportion of yolk than hens which lay small eggs. Also individuals may show a decided tendency to vary from the flock type in quite different degrees in different characters.

"The eggs of an individual tend to be either uniform or variable in all the egg characters, but certain individuals may be variable in certain egg characters and uniform in others. An individual is in general less variable than the race in respect to egg characters; but certain individuals may show a variation in an egg character which is relatively as great as the variation in the race. Also certain egg characters (particularly yolk weight) show a decided tendency to approach the race variation in several individuals. The factors which bring about the individuality in respect to egg characters are too complex for analysis from the data at hand."

With regard to the correlation of egg character it was determined that "each egg character is related to every other egg character, but different pairs of characters show a decidedly different degree of correlation. There is a general tendency for a given pair of characters to be similarly related in the eggs of the several individuals, but different individuals may show significantly different degrees of correlation in any pair of characters. Length and breadth are significantly but not highly correlated. Both length and breadth are significantly correlated with the weight of the whole egg and of each of the egg parts. Breadth is as a rule more highly correlated with these weight characters than is length. The shape of the egg as measured by the length-breadth index is negatively correlated with the weight of the egg and with the weight of each of the egg parts. The weight of each part of the egg is positively correlated with the weight of both the other parts."

It was noted that with respect to intraindividual variation "the variation among the eggs of the same bird is shown to be related to certain other changes in the bird. The egg weight and the weight of the egg parts, especially the weight of the yolk, increases as the bird matures. The rate of this gain in weight decreases with the successive months. Each part of the egg shows a seasonal fluctuation in weight which is apparently related to the general seasonal fluctuation in the physiological activities of the bird, expressed also in the curves for food consumption and egg production. The state of health also may affect the size of the egg. The size of the egg is related to the rate of production as it expresses itself in the laying of litters. As a rule the first and last eggs of a litter are smaller than the intermediate ones. When eggs are produced on successive days they tend to decrease in weight, while the egg laid on a day after one on which no egg is produced is larger than the last egg of the preceding series."

A biometrical study of egg production in the domestic fowl.—IV, Factors influencing the size, shape, and physical constitution of eggs, Maynie R. Curtis (*Arch. Entwickl. Mech. Organ., 39 (1914), pt. 2–3, pp. 217–327, figs. 18*).—This paper reports in more extended and detailed form the data noted above.

A bacteriological and chemical study of commercial eggs in the producing districts of the Central West, Mary E. Pennington et al. (*U. S. Dept. Agr. Bul. 51 (1914), pp. 77, pls. 8, figs. 2*).—This bulletin deals with the subject of the quality of eggs which go to the egg-breaking establishments of the egg-producing sections of the Central West.

It has been found that when the egg is laid it is of a fairly constant chemical composition and contains but few bacteria or molds. However, in the process

of marketing, eggs in shell undergo a variety of changes referable, almost exclusively, to the mode of handling. From former investigations (E. S. R., 22, p. 762) there was found an average of 2 organisms per gram in the white and 6 per gram in the yolk of perfectly fresh eggs when the incubation temperature was 37° C., and 7 organisms per gram in the white and 9 per gram in the yolk when the incubation was at 20°. The character of the organisms present was widely diversified. *Bacillus coli* is practically never present. As regards chemical composition of fresh eggs, whole eggs gave an average percentage of ammoniacal nitrogen of 0.0013. The moisture content is thought to be indicative of the egg's resistance to decay. In August and September, when the quality of the eggs is lowest, the maximum quantity of water is found in both white and yolk. In the early spring when eggs are of highest quality the water content is lowest, and in the cool days of autumn it occupies a medium position. An examination of what are termed "market-fresh" eggs showed that bacterially these eggs do not differ from strictly fresh eggs.

A study made of the relation between bacterial multiplication and chemical changes indicates that "for certain substances, at least, the number of organisms must approach the 100,000,000 per gram mark before the analytical methods for the detection of substances indicative of bacterial life can be applied satisfactorily."

Summarizing the bacteriological results of individual eggs opened aseptically in the laboratory, it was found that the greatest percentage of second-grade food eggs examined, the medium stale eggs, hatch-spot eggs, heavy rollers, dirty eggs, cracked eggs, and eggs with yolk partially mixed with albumin contained less than 1,000 bacteria per gram. *B. coli* was not present in the whole-shelled second-grade eggs and in only 5.9 per cent of the cracked-shelled eggs. In 26.5 per cent of the eggs with adherent yolks, 50 per cent of the eggs with dead embryos, 75.9 per cent of the moldy eggs, 66.7 per cent of the white rots, and 100 per cent of the black rots, over 1,000 organisms per gram were to be found. With the exception of the white and black rots, *B. coli* was present in but few of the eggs.

Conclusions reached from bacteriological and chemical examinations of composite sample of eggs opened commercially in the packing house are as follows: "The samples of July and August firsts contained very few organisms, and in many cases no bacteria of the *B. coli* group. The majority of the samples of clean-shelled seconds had a comparatively low bacterial content, only 8.3 per cent of them containing over 1,000,000 organisms per gram. The number of *B. coli* varied in different specimens from none to 100,000 per gram. The percentage of bacterial counts over 1,000,000 per gram in samples of dirties, checks, and eggs with yolk partially mixed with albumin was 16.6, 18.8, and 20 per cent, respectively. No greater number of *B. coli* was found in these samples than in samples of seconds.

"The samples of blood rings contained comparatively few organisms. The large blood rings in most instances showed more infection than did the small rings. Most of the specimens contained less than 10 *B. coli* per gram. The amount of protein decomposition as shown by the ammoniacal nitrogen in the preceding six types of eggs was greater, as would be expected, than that found in strictly fresh eggs, but was no greater than that found in some grocery eggs. Although a cracked or dirty shell may be a factor in facilitating infection and subsequent decomposition, the data obtained show that checks and dirties in the producing section are as well preserved as the clean whole-shelled seconds or the July and August firsts. The eggs constituting the samples of July and August firsts, seconds, dirties, and checks would be used without compunction by the housewife, baker, or confectioner.

"The majority of the samples of white rots, eggs with yolk lightly adherent to the shell, and all of the samples of sour eggs, black rots, eggs with a green albumin, and eggs with yolk heavily adherent to the shell, were infested with bacteria. *B. coli* was present in most of these samples, forming the predominating organism in the samples of sour eggs. The eggs with the yolk lightly adherent to the shell were, chemically, slightly lower in quality than were the second-grade food eggs, whereas the sour eggs, white rots, eggs with a green white, and eggs with yolk heavily adherent to the shell showed much more deterioration. Black rots had five times as much ammoniacal nitrogen as any of these types of eggs. With the exception, possibly, of the eggs with yolks lightly stuck to the shell, none of the eggs in these samples would be used by the housewife or reputable baker or confectioner."

An explanation of the technique used for the bacteriological and chemical examination of eggs is included.

Development of spurs and growth of the crest among females of the Gallinaceæ, A. PÉZARD (*Compt. Rend. Acad. Sci. [Paris], 158 (1914), No. 7, pp. 513–516, figs. 3*).—This reports successful operations of ovariotomy on pullets, with a resulting development of secondary male sex characters.

Studies on inheritance in pigeons.—I, Hereditary relations of the principal colors, L. J. COLE (*Rhode Island Sta. Bul. 158 (1914), pp. 311–380, pls. 4, fig. 1*).—A synopsis of the principal color characteristics of pigeons is presented, and the results of a study of the inheritance of certain colors of Tumbler pigeons and some of their modifications are summarized as follows:

"Only two kinds of pigment are concerned—red and black. Red (*R*) is potentially present in all the birds, but shows only when not inhibited, and when black (*B*) is absent, since black is epistatic to red.

"For the full development of intensity of red and black the presence of an intensity factor (*I*) is necessary. In the absence of this factor these colors remain in the dilute condition, red appearing yellow and black as dun. Another factor necessary for the full expression of black is one (*S*) which is presumed to cause the pigment to spread throughout the barbules of the feather instead of remaining clumped in the central part of the old barbule cells. When *S* is absent and the pigment is clumped as described, the appearance known as blue results. The dilute condition of blue is silver. The factor *S* affects only black pigmentation and does not produce any difference in the appearance of red, at any rate that has as yet been identified.

"White in the plumage of pigeons is due to an indefinite number of factors (W_1, W_2, etc.) which inhibit the production of pigment in the areas which they influence. Definite patterns may result from the approach of a homozygous condition for *W* factors which act on particular definite regions of the plumage. 'Reversion' to the wild blue Rock Pigeon type in domesticated pigeons is due simply to a recurrence of the particular combination of factors which are present in *Columba livia*. An extensive experiment on the inheritance of black and red showed an overproduction of red birds in F_2, the ratio being practically 2:1 instead of 3:1. This is not due to the absence of the homozygous dominant class as in yellow mice. Possible explanations are offered but no definite conclusion is reached.

"Different strains or family lines appear to have different tendencies as to the ratios of blacks and reds they produce in F_2. Lumping all of the results shows still a slight excess of reds. The ratios of intense to dilute birds from heterozygotes bred to other heterozygotes or to dilutes closely approximate Mendelian expectation, that is 3:1 and 1:1, respectively. Various matings of the different colors give the results expected according to theory. A considerable number of illustrative matings are presented. Illustrations are given of

matings of white to white, white to splash, white to self, splash to splash, and splash to self. In general, the offspring tend to be grouped around the parental mean with respect to amount of color in the plumage. The evidence supports the conclusion that a number of factors are concerned in the production of white and splashed birds."

A list of references is appended.

DAIRY FARMING—DAIRYING.

Dairying, J. A. FOORD, E. B. FITTS, J. B. LINDSEY, H. O. DANIELS, A. J. PIERPONT, P. H. SMITH, W. P. B. LOCKWOOD, and P. M. HARWOOD (*Mass. Bd. Agr. Bul. 6 (1914), pp. 147, pls. 11, figs. 5*).—This bulletin is a compilation of articles treating of general dairy topics, including barn building, breeding, care, feeding, and management of dairy cattle, use of silage, production of market milk, and related subjects.

Cassava meal in feeding dairy cattle, MALLÈVRE (*Bul. Soc. Nat. Agr. France, 74 (1914), No. 6, pp. 638–644*).—In experiments in which cassava meal was substituted for gluten meal in a regular ration of wheat bran, beets, chopped straw, and alfalfa hay for dairy cattle no material gain was secured either in quantity or quality of milk.

Cost of milk production, O. ERF (*Cream. and Milk Plant Mo., 2 (1914), No. 10, p. 11*).—The average cost of keeping a cow per year as determined from data secured by the Ohio Experiment Station is estimated to be $73.68. After crediting her with the by-products, the estimated cost of milk produced is for a 3,000 lb. cow 21.1 cts. per gallon, for a 4,000 lb. cow 15.8, 5,000 lb. cow 12.7, 6,000 lb. cow 10.6, and 7,000 lb. cow 9.05 cts.

Relation of conformation and mammary system to milk and butter fat production, V. F. DOLCINI (*Univ. Cal. Jour. Agr., 1 (1914), No. 9, pp. 9–11*).—Studies made of the conformation of a number of cows lead the author to conclude that there is a positive correlation in most cases between the different points of conformation and production and also a correlation between all points of the mammary system and production. The important points seem to be circumference of barrel, width and depth of chest, open frame work, and rump conformation. It was found that a pound of milk fat can be produced more cheaply in a high producing animal than in a low producing one.

The specific heat of milk and milk derivatives, A. R. JOHNSON and B. W. HAMMER (*Jour. Indus. and Engin. Chem., 6 (1914), No. 7, pp. 569–573, figs. 4*).—The experimental technique is fully described and data are reported showing the variation with the temperature of the specific heat of milk and a number of milk products, including whey, skim milk, cream, and butter.

Studies on the ash of colostrum milk with particular reference to its quantity and composition several days after calving, M. SATO (*Trans. Sapporo Nat. Hist. Soc., 5 (1914), No. 2, pp. 96–110*).—This reports analyses made of the colostrum milk of six mature cows immediately after and 24 hours after calving. The average specific gravity of the former was 1.0656, of the latter 1.0385; the fat content 4.8 and 3.6 per cent; the ash content 1.03 and 0.899 per cent; and the reaction, amphoteric in both cases.

The ratio of potassium oxid to sodium in the ash colostrum milk immediately after calving was 1.9:1, of milk 24 hours after calving 21:1. The calcium oxid, phosphoric acid, and sulphuric acid content were quite variable. The chlorin content is about the same as for normal milk.

Cow's milk for infants in Saxony, E. W. THOMPSON (*Cream. and Milk Plant Mo., 2 (1914), No. 11, pp. 25–27*).—This is an account of the production in Saxony of what is known as "Kindermilch." The text of the ordinance of

the city of Dresden, relating to the production and sale of this milk, is given. The health of the cow, the feed, surroundings, and operation of milking are all under strict control. Great importance is attached to giving dry feed as distinguished from all kinds of sloppy feeds, such as distillery waste, silage, and beet tops. The usual sources of carbohydrates are dry hay, wheat bran, rye bran, and small amounts of green fodder cut and taken to the stall. The protein content is brought up to the desired ratio with cotton-seed meal, peanut meal, copra meal, coconut meal, or linseed meal.

Results secured at the Racknitz Dairy show that when milk is produced under certain rigid conditions the bacterial content may be kept within safe limits without the necessity of sterilizing by heat. It is stated that the dairy has records showing a count of from zero to 280 bacteria per cubic centimeter against 220,000 in good commercial milk. It is shown that in the eight years since the consumption of this milk has begun, infant mortality has decreased from 21.7 to 12.5 per cent in Dresden, and from 17.8 to 5.5 per cent in suburbs of Dresden.

Comparison of the plating and microscopic methods in the bacteriological examination of milk, G. W. GOODRICH (*Jour. Infect. Diseases, 14 (1914), No. 3, pp. 512–519*).—In comparing the relative value of the plate and microscopic methods in the bacteriological examination of milk the author concludes that there is a marked correlation between the two counts; that the factor 20,000 which is used to reduce the microscopic counts to terms of the plate count is satisfactory; and that the microscopic count from a single slide can be depended upon as being within the limits of one-third as great to three times as great as the plate count, but can not be depended upon as being within 10,000 of the plate count. The microscopic count from a single slide is not sufficiently reliable to warrant the condemnation of market milk, especially when the standard for passing is a low count. Any milk which is "passed" on the microscopic count from a single slide where the passing standard is a low count is not likely to have a dangerously high count by the plate method.

A bacteriological index for dirt in milk, J. J. KINYOUN (*U. S. Naval Med. Bul., 8 (1914), No. 3, pp. 435–442*).—In discussing the relative importance of a bacteriological index for dirt in milk the author concludes after an examination of about 3,000 samples of milk that in good milks there is present on a general average 1 colon bacillus to 50,000 bacteria in the milk; in dirty milk, 1 colon bacillus to 555. He is of the opinion that cleanliness in the production is the most important of all factors entering into the milk problem. The employment of a standardized Endo medium, as described in this article, is recommended for isolating the colon group.

Ability of streptococci to survive pasteurization, S. H. AYERS and W. T. JOHNSON, JR. (*U. S. Dept. Agr., Jour. Agr. Research, 2 (1914), No. 4, pp. 321–330, figs. 3*).—The authors of this paper summarize their investigations as follows:

"The thermal death points of 139 cultures of streptococci isolated from cow feces, from the udder and the mouth of the cow, and from milk and cream showed a wide variation when the heating was performed in milk for 30 minutes under conditions similar to pasteurization. At 60° C. (140° F.), the lowest pasteurizing temperature, 89 cultures, or 64.03 per cent, survived; at 62.8°, the usual temperature for pasteurizing, 46, or 33.07 per cent, survived; and at 71.1° 2.58 per cent of the cultures survived; all were destroyed at 73.9°.

The streptococci from the udder were, on the whole, less resistant and those from milk and cream more resistant to heat than those from the mouth of the cow and from cow feces. When heated to 60° all of the 18 cultures from milk and cream survived; at 62.9° 17, or 94.44 per cent survived; at 68.3° 9 cultures,

or 50 per cent, withstood the heating process. All the streptococci from milk and cream were destroyed by heating to 73.9° for 30 minutes.

"Among the 139 cultures of streptococci there were 22 that formed long chains, which, for the purpose of this paper, were considered as typical streptococci. The others were considered atypical. The typical streptococci were much less resistant to heat than were the atypical. Of the 22 typical streptococci 12, or 54.54 per cent, survived heating for 30 minutes at 57.2°; at 60° 9, or 40.91 per cent, survived; at 62.8° only 1 culture, or 4.54 per cent, withstood the heating. All of the typical streptococci were destroyed by heating for 30 minutes at 65.6°. The 117 atypical streptococci were more resistant; at 60° 68.37 per cent survived; at 62.8° 38.46 per cent survived; and at 71.7° 2.56 per cent survived; all were destroyed at 73.9°.

"Two classes of streptococci seem to survive pasteurization: (a) Streptococci which have a low majority thermal death point but among which a few cells are able to survive the pasteurizing temperature. This ability of a few bacteria to withstand the pasteurizing temperature may be due to certain resistant characteristics peculiar to a few cells or may be due to some protective influence in the milk. (b) Streptococci which have a high majority thermal death point. When such is the case, the bacteria survive because the majority thermal death point is above the temperature used in pasteurization. This ability to resist destruction by heating is a permanent characteristic of certain strains of streptococci. The thermal death point determinations in this work were made in milk in such a manner as to represent actual conditions of pasteurization by the holder process; therefore the results show what may be expected in commercial pasteurization, and it is evident that some streptococci may survive the process. However, different results might have been obtained if a larger number of cultures had been studied and if other methods and media had been used for determining the thermal death points."

The application of refrigeration to the handling of milk, J. T. Bowen (*U. S. Dept. Agr. Bul. 98 (1914), pp. 88, figs. 37*).—This bulletin discusses the application of refrigeration in the operation of the modern milk plant and describes the various forms of mechanical and other systems of cooling.

After treating of the physical changes, including specific heat, cohesion, viscosity, and coefficient of expansion and freezing, and the bacteriological changes of milk and cream the author takes up a discussion of the principles involved in cooling by means of salt and ice mixtures. Curves are given showing the approximate temperature obtained with different proportions of salt, the refrigeration available with different percentages of salt, and the specific heat of common salt brine with different percentages of salt. The ice bunker, gravity brine, compression and vapor absorption systems of refrigeration are treated, together with their installation and operation. Methods of utilizing refrigeration described are the direct expansion, brine circulating, brine storage, congealing tank, and air-circulating systems.

Other subjects discussed are insulation, size and cost of plants, and cooling milk on the farm, during transportation, and at the receiving stations, bottling plants, and creameries.

A study of the market butter of Boston, M. J. Rosenau, W. D. Frost, and Ruth Bryant (*Jour. Med. Research, 30 (1914), No. 1, pp. 69–85*).—Twenty-five samples of butter, representing the market supply of Boston and scoring from 80 to 98, were studied.

There appeared to be no definite relation between score and price. Attempts were made, without success, to devise a practical dirt test for butter.

The average number of bacteria per gram was determined by emulsifying the butter in warm water. The average number for the 25 samples was

5,700,000 per gram; the lowest number was 8,600 and the highest 41,000,000. There was no particular relation between the number of bacteria and any other constituent determined, such as salt reaction, moisture, etc. The number of bacteria diminished markedly with age, in one sample 85.8 per cent in 2 weeks, in another 93.7 per cent in 4 weeks, and in another 95.6 per cent in 6 weeks. The number of bacteria may therefore be used as an index to the age of the butter.

Bacillus coli was found in only 6 of the 25 samples and then only in small numbers. It seems that *B. coli* soon dies out in butter. Streptococci were found in 14 samples, but no special relation between their presence and virulence as tested upon guinea pigs could be made out. *Bacterium welchii* was not found in any of the samples. Tubercle bacilli were demonstrated in 2 of the 21 samples tested for these organisms and from butter of apparently first quality. Pasteurization of cream intended for butter is recommended.

Butter (*Maine Sta. Off. Insp. 58 (1914), pp. 21–32*).—This reports official inspections made of the weight and chemical analyses of samples of package butter in different parts of the State.

Inquiry into the factors which control the texture of Cheddar cheese, I, A. GEAKE (*Jour. Agr. Sci. [England], 6 (1914), No. 2, pp. 169–178, figs. 3*).—This investigation was undertaken with the view of ascertaining the influence of acidity on curd, caseinogen, and casein. In the course of the investigation the following acids were used: Fatty acids; formic, acetic, propionic, butyric, isobutyric, valerianic, and isovalerianic acids; oxyacids; and glycollic, lactic, α-oxybutyric, β-oxybutyric, and oxyisobutyric acids.

It was shown that in the presence of weak organic acids, caseinogen and casein swell and finally dissolve to a greater or lesser extent. The presence of lactic or acetic acids hindered the solution of rennet curd. This is explained as being due to the acids hindering the action of the enzyms, since these solutions did not become putrid so readily as those in pure water. The acid curd, in which the presence of large amounts of enzyms was excluded, was much more readily dissolved by the acids than by water and by the stronger than by the weaker lactic acid solutions. It was found that the addition of sodium chlorid to lactic acid solutions of caseinogen lessens the solubility of the caseinogen and if sufficient salt is added the protein is more or less completely salted out. It was noted that there is a "very rapid change in the percentage of caseinogen precipitated by concentrations of sodium chlorid between about 0.1 N and 0.17 N. At the former concentration the amount of caseinogen precipitated is less than 10 per cent, and at the latter is more than 90 per cent. This illustrates the value of the method of separating proteins by fractional salting out from solution."

VETERINARY MEDICINE.

Atlas and text-book of the more important animal parasites and their means of transmission, R. O. NEUMANN and M. MAYER (*Atlas und Lehrbuch wichtiger tierischer Parasiten und ihrer Überträger mit besonderer Berücksichtigung der Tropenpathologie. Munich, 1914, vol. 11, pp. VI+580+93, pls. 49, figs. 260; rev. in Science, n. ser., 40 (1914), No. 1023, pp. 210–212*).—This work, which deals with the more important animal parasites, includes 45 colored plates.

Vaccination for infectious diseases, R. M. STALEY (*Proc. Penn. State Vet. Med. Assoc., 30 (1913), I, pp. 64–69; Amer. Vet. Rev., 43 (1913), No. 6, pp. 611–617*).—This deals especially with the methods as carried out by the Com-

monwealth of Pennsylvania, with particular reference to anthrax, blackleg, and hog cholera.

The lecithin content of different tissues, J. CRUICKSHANK (*Abs. in Jour. Path. and Bact., 18 (1913), No. 1, pp. 134–136*).—The amount of lecithin in different tissues was determined, the procedure used consisting in brief in extracting the tissues with alcohol or ether and treating the residue from the evaporated extract with hot acetic ether. "On cooling this solution a precipitate results. After purification by repeated solution in, and precipitation from, hot acetic ether the precipitate is dissolved in ether (any material insoluble in ether is removed by rapidly centrifugalizing), and the solution is precipitated with excess of acetone. Solution in ether and precipitation with acetone is repeated a number of times till the precipitate is completely soluble in ether. Finally, the acetone precipitate is shaken with cold alcohol. The fraction soluble in cold alcohol constitutes the 'lecithin.' The amount of lecithin present has been estimated by evaporating to dryness a known volume of the alcoholic solution and weighing the residue."

The amount of lecithin found in 100 gm. of wet tissue was as follows: Ox's heart, kidney, spleen, lungs, testicles, thyroid, pancreas, and submaxillary gland, 0.36, 0.48, 0.14, 0.4, 0.62, 0.3, 0.68, and 0.3 gm., respectively; sheep's liver and red corpuscles, 1.6 and 0.12 gm., respectively; ox's red corpuscles 2.5 gm.; and human brain 0.6 gm.

"A number of these tissues have also been fixed in formalin, dried to constant weight, and extracted with ether in place of alcohol. The amount of lecithin obtained by this method has in all cases been small, generally about one-tenth of the amount obtained by extracting a corresponding amount of the same dried tissue with alcohol. It has been found that the yield of lecithin from certain dried tissues by extraction with alcohol may be considerably less than that obtained from the corresponding amount of the same tissue extracted in the wet state. This difference occurs more particularly with tissues (brain, blood) which in the dried condition are difficult to reduce to a fine powder, and is probably attributable to want of proper penetration of the tissue by the extracting fluid.

"In estimating the amount of lecithin, it is inconvenient to work with very large amounts of acetone precipitate, as it is difficult, without the use of sand or other material by which the precipitate may be triturated, to extract the whole of the lecithin. Further, the amount of lecithin in any precipitate can only be estimated by thorough extraction of the precipitate with cold alcohol, as it has been found that the proportion of lecithin in acetone precipitates varies considerably."

A comparative study of the chemical and biochemical properties of lipoid substances as extracted from pig's liver and egg yolk, F. P. WILSON (*Jour. Path. and Bact., 18 (1913), No. 1, pp. 60–63*).—"The best anticomplementary property is shown, as in the case of the liver, by the acetone-insoluble fraction of the ether extract. The figure obtained is very low compared with the liver, and is practically equalled by the other acetone-insoluble fractions. The hemolytic property is absent in all fractions, and in this connection it may be noted that the saponification values are much the same as in the liver, but the iodin values are higher. In both liver and egg yolk a high iodin value is accompanied by an increased anticomplementary action, but in the case of the liver the converse does not hold good.

"No relation appears to exist between the anticomplementary property and the percentage of nitrogen and phosphorus, nor apparently is there anything in the ratio of N : P. It is noteworthy that the acetone-soluble portion of the

hot alcohol extract contains the highest percentage of phosphorus, the next highest figure being found in the acetone-insoluble fraction of the same extract. In the case of the liver the phosphorus was practically all in the acetone-insoluble fractions, and especially in that of the ether extract. In short, it is apparent that the lipoids of egg yolk differ widely in certain chemical and biochemical properties from those obtained from a mixture of several pigs' livers."

An attempt to preserve hemolytic complement in a permanent form, H. R. DEAN (*Abs. in Jour. Path. and Bact., 18 (1913), No. 1, pp. 118, 119*).—"The main object of these experiments was to obtain hemolytic complement in a state in which it could be preserved and used in place of fresh serum. This object was not attained. The method employed was such as to effect a separation of the lipoid and protein constituents of serum, and it is possibly of interest to note that the separated protein was rich in mid-piece fraction, but contained traces only of end-piece."

Two important western poisonous plants, H. G. KNIGHT (*Proc. Soc. Prom. Agr. Sci., 33 (1912), pp. 51–58*).—The data here presented relating to the woody aster and death camas have been previously noted (E. S. R., 28, p. 197). See also a subsequent note (E. S. R., 29, p. 77).

Studies in the toxicity of cotton-seed meal, W. A. WITHERS and B. J. RAY (*Proc. Soc. Prom. Agr. Sci., 33 (1912), pp. 19–21*).—Previously noted (E. S. R., 28, p. 197).

A remedy for cotton-seed meal poisoning, W. A. WITHERS (*North Carolina Sta. Circ. 5 (1913), pp. 3*).—The data here presented relating to experiments with rabbits have previously been noted from another source (E. S. R., 29, p. 477). In addition, brief mention is made of preliminary tests with swine.

Twelve pigs, weighing an average of 50 lbs., were fed daily 0.5 lb. of cotton-seed meal and 1.5 lbs. of corn meal, the ration being increased as the pigs grew. In addition, a solution of copperas was given to 6 of the pigs. At the time of writing, or thirteen weeks after the experiments were commenced, 4 of the 6 pigs receiving the cotton-seed meal without the iron salt had died and the remaining 2 had a very unthrifty appearance and had made an average gain of but 35 lbs. The 6 which had received an iron salt had gained an average of 54 lbs. "Based upon these results, iron salt appears to be of value in diminishing, if not entirely preventing, the harmful effects to swine of cotton-seed meal feeding, provided that feeding is not in excess of the rate of 1 lb. of meal daily to each 100 lbs. of live weight."

The directions given for the preparation and use of the iron solution are as follows: "Dissolve 1 lb. of copperas (ferrous sulphate) in a barrel (about 50 gal.) of water. For each pound of cotton-seed meal take 1 gal. of the solution, mix thoroughly daily for each 100-lb. pig. If the pig weighs only 50 lbs., use half the amount of cotton-seed meal and one-half of the copperas solution."

The diagnosis of anthrax according to Ascoli's and Schütz-Pfeiler's methods, F. FISCHOEDER (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 13 (1913), No. 6, pp. 317–322*).—Continuing previous work (E. S. R., 28, p. 477), the author reports tests made with the Schütz-Pfeiler precipitating serum. In all cases where anthrax bacilli, whether living or dead, were present in the material examined, anthrax could be diagnosed by the Schütz-Pfeiler method.

A diagnosis of anthrax sepsis with the lumbar puncture, L. POLLAK (*Wiener Klin. Wchnschr., 25 (1912), No. 43, pp. 1702–1704, fig. 1; abs. in Centbl. Bakt. [etc.], 1. Abt., Ref., 56 (1913), No. 12, p. 355*).—A minute description of cases in which it was possible to detect the causative organism in the cerebrospinal fluid. The fluid was centrifuged, and in the sediment the *Bacillus anthracis* was noted by the usual method.

Infectious bulbar paralysis, pseudo-rabies or Aujeszky's disease, L. Panisset (*Rec. Gén. Méd. Vét., 23 (1914), No. 275, pp. 601–618, figs. 4; abs. in Jour. Compar. Path. and Ther., 27 (1914), No. 2, pp. 179–182*).—A summarized account of the disease with references to the literature.

A contribution on the cultivation, isolation, and disinfection of the blackleg bacillus, E. Hölzel (*Centbl. Bakt. [etc.], 1. Abt., Orig., 71 (1913), No. 2–3, pp. 147–165*).—A report of the results of investigations of *Bacillus gangrænæ emphysematosæ* at the Pathological Institute of the Veterinary High School at Munich.

A contribution to the knowledge of Bacilius mallei, M. Carpano (*Centbl. Bakt. [etc.], 1. Abt., Orig., 71 (1913), No. 4, pp. 267–285, pls. 3*).—This paper deals with the morphology and biology of the glanders bacillus.

Observations on the clinical diagnosis of glanders, C. H. Schultz (*Philippine Agr. Rev. [English Ed.], 6 (1913), No. 8, pp. 380–385, pl. 1*).—After reviewing the literature in regard to the value of the various tests for diagnosing glanders, the author points out that he has been able to verify de Blieck's findings (E. S. R., 26, p. 376) in regard to the value of the conjunctival reaction when using crude mallein in the eye. "During an investigation of an outbreak of contagious disease among native ponies at Calamba . . . its application gave negative results. *Streptococcus equi* was subsequently isolated from the afflicted animals, thus identifying the disease as strangles."

The vitality of the hemorrhagic septicemia organism outside the body, J. D. E. Holmes (*Mem. Dept. Agr. India, Vet. Ser., 2 (1914), No. 4, pp. 105–118*).—This paper consists of three parts, the first dealing with the effect of exposure of the virus to direct sunlight, the second with the vitality of the virus when protected from direct sunlight, and the third with tests on cattle.

It was found that exposure to direct sunlight for one day kills the virus both in broth cultures and in sterile dry earth. When exposed to direct sunlight in agar slant cultures the virus is killed in five days. Agar and broth cultures when kept in the shade at air temperature maintain their virulence for guinea pigs for six weeks or longer, and broth cultures mixed with sterilized moist earth keep their virulence for guinea pigs for a similar period. In surface water protected from direct sunlight the virus maintains its vitality for about three weeks. Broth cultures mixed with unsterilized mud and protected from sunlight maintain their virulence for three months and longer.

In experiments with cattle it was found that the virulence of the organism is reduced after it has remained for some time in mud, but is still fatal for more susceptible animals. After passage through cattle the original virulence is recovered. Bovines in normal health can resist large amounts of virulent broth cultures when ingested. The ingestion of virus confers an immunity against a lethal dose of culture inoculated subcutaneously three weeks after the ingestion. Bovines whose resistance has become lowered from fatigue, poor condition, exposure, and other like causes, are very susceptible to the ingestion of the virus when ingested.

Contribution to the cultivation of the parasite of rabies, H. Noguchi (*Jour. Expt. Med., 18 (1913), No. 3, pp. 314–316, pl. 1*).—In the experiments about 50 series of cultivations were made with the brain or medulla removed aseptically from rabbits, guinea pigs, and dogs infected with street virus, passage virus, or fixed virus. The method of cultivation was the same as that used for the spirochetes of relapsing fever. In the culture minute chromatoid bodies arise which on subsequent transplantation reappear in the new cultures throughout many generations. The bodies from all the viruses seemed to be alike. The smallest of these could just be seen with a Zeiss apochromatic 2-mm. lens.

In four different instances in cultures from the passage and fixed virus nucleated round or oval bodies, surrounded with a membrane totally different from the minute bodies mentioned above, were noted.

"By inoculating cultures containing the granular, pleomorphic, or nucleated bodies, rabies has been reproduced in dogs, rabbits, and guinea pigs, as shown by the typical symptoms and positive animal inoculations, while the film preparations from the brain of the animals contained always the granular and sometimes the nucleated bodies in large numbers."

Contribution to the study of the filtrate of the rabies virus, NEUMANN and T. MIRONESCO (*Compt. Rend. Soc. Biol. [Paris], 74 (1913), No. 12, pp. 712, 713*).—The filtrate from the rabies virus has been found to be very variable as regards strength. In order to see if a homogeneous virus could be obtained, the brain of a rabbit which died of the disease was rubbed up in a mortar with 100 cc. of a normal serum, and the emulsion obtained was shaken up in a bottle containing glass beads for about one hour. The emulsion was then filtered through a sterile gauze, and at this juncture there was added an emulsion made from two 24-hour agar cultures of the *Bacillus pyocyaneus* and emulsified with normal serum. The entire mixture was then diluted with 300 cc. of normal serum, mixed well, and filtered through a Berkefeld V filter under a pressure of from two to five atmospheres.

Some rabbits were then inoculated with the filtrate and others with the unfiltered virus. The rabbits receiving the filtrate died in the same time as those receiving the unfiltered virus. The brains of the rabbits dying as a result of the injection of the filtrate were infectious for other rabbits.

The diagnosis of rabies, H. KOENIGSFELD (*Centbl. Bakt. [etc.], 1. Abt., Orig., 70 (1913), No. 1–2, pp. 85–98; abs. in Ztschr. Fleisch u. Milchhyg., 24 (1913), No. 3, p. 64*).—In this work it was possible to verify the findings of others that the rabies virus can penetrate the skin or mucous membrane through superficial wounds and cause the disease. The corneal and cutaneous methods will in many cases determine the presence of the disease even though putrefied material is used for the tests. The incubation periods, etc., are often lengthened when putrefied material is used in the experiments.

The treatment of tetanus, J. SCHMIDT (*Ber. K. Tierärztl. Hochschule Dresden, n. ser., 7 (1912), p. 151; abs. in Vet. Rec., 26 (1913), No. 1324, p. 326*).—A comparison of nine cases of tetanus in the horse. Two of the animals were treated with morphin and chloral hydrate alone and the other seven with tetanus antitoxin only. The two first-mentioned horses were slaughtered, being incurable, one after 12 hours and the other 3½ days after treatment. Of the other seven, four recovered, two died, and one was slaughtered. The antitoxin was given intravenously.

Double infection with the human and bovine types of Bacillus tuberculosis, P. A. LEWIS (*Jour. Amer. Med. Assoc., 60 (1913), No. 3, pp. 202, 203*).—A description of a case in a man, by occupation a butcher, in which the lungs were affected by the human type of organism, and the thumb (tuberculosis verrucosa cutis) by the bovine type of organism.

Investigations in regard to the isolation of the human and bovine types of tubercle bacilli from cultures of atypical virulence (Schroeder-Mietzsch strain) and from artificially mixed cultures, E. A. LINDEMANN (*Arb. K. Gsndhtsamt., 45 (1913), No. 2, pp. 197–225*).—The Schroeder-Mietzsch culture is an atypical culture isolated from a 20-year old woman affected with pulmonary tuberculosis. It grows like the bovine type in bouillon, but lacks the virulence of this type of organism. Thinking that it might be a mixed culture, although investigations by others have proved the contrary, the author made tests with it on rabbits, guinea pigs, and chickens, and in bouillon. The results

were negative, but he is not inclined to believe that it can be classified with the human type of organism. The gallinaceous type is not present in the culture.

Some tests with artificially mixed human and bovine type cultures were then made for the purpose of determining to what degree such cultures, which have been artificially cultivated for a long time, may be separated. Nine out of ten cultures prepared from the two types could be isolated and identified. Even though one of the types was present in a dilution of 1:50 with the other type, it could be detected. In the tenth mixture of types only the human kind could be isolated. The test showed in an indirect way the constancy of the various types.

In regard to the etiology and serodiagnosis of human, bovine, and avian tuberculosis, G. RONCAGLIO (*Rapporti Eziologici e Sierodiagnostici fra Tubercolosi Umana, Bovina, Aviaria. Parma, Italy, 1912, pp. 199; abs. in Ztschr. Immunitätsf. u. Expt. Ther., II, Ref., 6 (1913), No. 14, p. 995*).—In this work the etiological, clinical, and serodiagnostic relations which exist between human, bovine, and avian tuberculosis were studied. The first part of the work is mainly historical in nature and gives a good perspective of the present status of this problem. The biological methods used were the complement fixation test, meiostagmin reaction, and passive anaphylaxis. The tests made were too few and did not allow a definite conclusion as to the types of bacilli present. The meiostagmin reaction, however, gave the best results.

The occurrence of avian tuberculosis in man, E. LÖWENSTEIN (*Wiener Klin. Wchnschr., 26 (1913), No. 20, pp. 785–787*).—The author states that avian tuberculosis occurs more frequently in man than is usually supposed, and may be due to eating eggs from tuberculous hens. The cases can be definitely classified from the bacteriological and clinical findings, but a much simpler method is to employ the avian tuberculin test. Artificially infected eggs when soft-boiled showed living organisms. In all cases where acid-fast bacilli are found which are not pathogenic for guinea pigs, tests must be made with rabbits and hens.

Studies in avian tuberculosis, L. R. HIMMELBERGER (*Centbl. Bakt. [etc.], 1. Abt., Orig., 73 (1914), No. 1, pp. 1–11, pls. 2*).—In this contribution from the Michigan Experiment Station, after reviewing some of the literature relative to avian tuberculosis, the results of cultural, transmission, and agglutination tests are reported.

It was found possible to cultivate the avian tubercle bacillus on sterile bananas and glycerinated slants of carrots, turnips, and garden beets. The results suggest that the media tried may eventually be used as a means of differentiation.

Transmission experiments were made with tuberculous chickens and white rats, guinea pigs, rabbits, and calves. The attempts to infect rats by cohabitation with tuberculous hens and two guinea pigs, one rabbit, and two rats, by injecting a broth culture of the avian tubercle bacillus subcutaneously, resulted negatively. One rabbit, however, showed an abscess at the site of injection which was found to contain the tubercle bacillus. Three other rabbits, which received an intravenous injection of a suspension of macerated tubercular material from a diseased hen and were killed two months later, showed no evidences of infection.

The results with twin calves one week old from a nontubercular herd, which were fed with milk and the macerated organs of a tubercular hen as previously noted by Giltner (E. S. R., 28, p. 476), showed in one case a reaction with avian tuberculin but none with mammalian tuberculin as applied some months later. About five months afterward it again reacted to avian tuberculin, and

on autopsy was found to have lesions in the abdominal viscera, although the bacilli could not be isolated from the lesions. Another calf, which was injected with a suspension of tubercular lymph nodes and tested five months later with avian tuberculin, gave a decided reaction, but no lesions were found on autopsy.

A fourth calf, which was fed with the macerated organs of tubercular hens, gave positive tests to both avian and bovine tuberculin. Fifteen days elapsed between the application of the tuberculins. The results support the view "that avian tuberculin will not immunize an animal against the anaphylactic action of ordinary tuberculin or vice versa. The response to this test with ordinary tuberculin weakens the supposition advanced previously that a difference exists in the avian and ordinary tuberculins. This calf was killed and examined postmortem with the following findings: Liver presented many yellowish, white spots ⅛ cm. in diameter, smears from which showed presence of tubercle bacilli. Hepatic lymph glands were normal, however. Mesenteric lymph nodes opposite union of jejunum and ileum enlarged and tubercular. No lesions were found in the intestines."

Agglutination tests with normal and diseased fowls are reported upon, and the results, while encouraging, do not warrant the drawing of positive conclusions because the number of birds examined was too few. The possibility of using the precipitin, agglutination, and complement-fixation tests as diagnostic agents is emphasized.

Avian tuberculosis, L. Van Es and A. F. Schalk (*North Dakota Sta. Bul. 108 (1914), pp. 3–94, pls. 3, fig. 1*).—This discusses the history, geographic distribution, economic importance, etiology, modes of transmission and pathogenesis, lesions, symptoms, and diagnosis of avian tuberculosis, with special reference to its occurrence in fowls, and reports experiments in applying the tuberculin test to the diagnosis of tuberculosis in fowls. An extensive bibliography is appended.

"Owing to the negative results obtained by previous investigators when the subcutaneous, ophthalmic, or cutaneous method of application was used, the writers experimented almost exclusively with the intracutaneous method of tuberculin application introduced by Moussu and Mantoux [E. S. R., 21, p. 582]." A portion of the experiments (320 birds) has been reported from another source (E. S. R., 30, p. 381), but in all 601 tests were made. The number of fowls given autopsy was 277, the number of birds found to have lesions was 125, and those showing typical reactions were 90 in number. The reacting fowls with lesions were 88, or 97.77 per cent. The number of nonreacting fowls was 130, of which 120, or 91.53 per cent, were without lesions. There were 57 fowls with doubtful reactions, and of these 27, or 47.36 per cent, had lesions. In many of the cases the lesions were confined to a single organ.

A tuberculin reaction in chickens is considered an almost certain indication of tuberculous infection. "While nothing less than a great amount of practical experience obtained under all kinds of conditions will be necessary to establish the usefulness of the intradermal tuberculin test in the eradication of tuberculosis from farm poultry, the results obtained in experiments are strongly suggestive of its value."

As tuberculosis is considered a chronic, essentially progressive disease, and the treatment of avian tuberculosis is impracticable, prophylaxis as a means of eradication of tuberculosis from a flock is suggested. "The owners of a healthy flock should be careful in the introduction of new stock, and when the latter is procured from unknown or questionable sources, it would be advisable to subject the fowls to a tuberculin test before they are permitted to mingle with the healthy birds."

The data presented show that more of the older fowls in a flock are usually diseased, and as such constitute the greatest factor in the distribution of avian tuberculosis. "After the elimination of the older birds the remainder of the flock may be tuberculin tested in the manner indicated, and all fowls reacting either typically or doubtfully should share the same fate as the older birds. . . . Certain phases of the management of poultry must be given consideration in connection with tuberculosis. Clean, airy, well-lighted [roomy] quarters are less apt to promote the spread of the disease than when the opposite is the case. . . . To what extent the disease is transmitted by means of eggs can not be said at this time, but even if the danger from this source is probably a slight one, common prudence should cause one to avoid the use of eggs from tuberculous birds for setting purposes.

As an indication of what may be accomplished in the eradication of tuberculosis from a rather heavily infected flock of chickens, the authors relate that in the beginning of 1913 a flock of 249 chickens was found by tuberculin test and autopsy to be tuberculous to the extent of 43.37 per cent. Eliminating all reacting and undesirable birds 56 nonreacting fowls were retained, to which were added 47 new purchases which did not react to the test. During the summer one more bird died with tuberculosis, and is regarded as a case which failed to react on account of very extensive lesions. A year later the flock had again increased to 249 fowls, and the test revealed only 2.41 per cent of tuberculosis. "All those cases showed very slight lesions, probably incipient, and may be attributed to infection by the missed case which died during the summer."

In discussing the relation of avian to mammalian tuberculosis it is concluded that "with the possible exception of swine the danger to mammals from avian infection sources is probably very slight and negligible," but as we have no knowledge how soon an avian organism in a mammal may become adapted to its new surroundings and become capable of producing mammalian disease, "it is apparent that prudence demands that fowl tuberculosis be so controlled as to prevent its transmission to other farm stock."

Prophylaxis with attenuated tubercle bacilli, M. RABINOWITSCH (*Berlin. Klin. Wchnschr., 50 (1913), No. 3, pp. 114, 115; abs. in Jour. Amer. Med. Assoc., 60 (1913), No. 9, pp. 703, 704*).—A method is described with which it is possible to reduce or enhance the virulence of the tubercle bacillus at will. It is done by allowing vapors of formaldehyde to act on the culture, and then transferring the culture to a fresh serum medium. A strain derived from the blood of a tubercular subject and highly virulent for both rabbits and guinea pigs became avirulent by this treatment.

"Two guinea pigs inoculated subcutaneously with 0.002 gm. of the culture showed no signs of infection when killed six weeks later, while others inoculated in the same way and then, after two months, inoculated with the same amount of a highly virulent culture, human and bovine, showed no signs of infection when killed six weeks later. The controls developed tuberculosis in a very severe form."

Studies on the biochemistry and chemotherapy of tuberculosis.—VII, Report of some experimental work on the use of methylene blue and allied dyes in the treatment of tuberculosis, LYDIA M. DE WITT (*Jour. Infect. Diseases, 13 (1913), No. 3, pp. 378–403, figs. 2*).—"Methylene blue will penetrate the tubercle, stain the living tubercle bacillus, and in some cases kill the bacillus in vitro and in others lessen its virulence. When added to the culture media, a relatively small percentage of methylene blue will inhibit the growth of the human tubercle bacillus. Methylene blue iodid is no less irritant than the

chlorid and has less bactericidal power and no greater therapeutic value. The new methylene blues are various modifications of the methylene blue molecule and have in the main no advantage over methylene blue. New methylene blue GG, however, showed some effect in the one case in which it was used therapeutically, and it, with other oxygen derivaties of methylene blue, will be given further tests.

"Selenium blue and tellurium blue are new blue dyes in which the sulphur of the methylene blue molecule is replaced by selenium and by tellurium. They are weaker and less stable dyes than methylene blue and more toxic and less bactericidal than that dye. They penetrate the tubercle, and are reduced in it, and can be reoxidized; they stain the living tubercle bacillus, but more faintly than does methylene blue. In fact they behave in all respects as weaker editions of methylene blue and have no advantage over it.

"Neither methylene blue nor any of the allied dyes tested by me may be said to have much therapeutic influence over experimental tuberculosis of the guinea pig. While methylene blue seems for many reasons a favorable starting point for tuberculosis chemotherapy, other modifications of it, and probably many others, must be tried before a claim to have found a specific for this disease [can be made]."

Acid-fast bacilli in milk, J. M. BEATTIE and F. C. LEWIS (*Abs. in Jour. Path. and Bact., 18 (1913), No. 1, pp. 122, 123*).—Special stress is laid on the fact that acid-fast bacilli occur in milk which are totally different from tubercle bacilli. These organisms, however, grow very well in milk at ordinary temperatures. The bacillus is Gram-positive, nonmotile, nonliquefying, and in morphology is rather thick and stains more uniformly than the tubercle bacillus. When grown in milk many of the rods isolated from inoculated animals closely resemble the human and bovine types of tubercle bacilli.

The authors believe that the microscopic method for examining milk for the presence of the tubercle bacillus should not be substituted for the inoculation method.

Investigations in regard to the experimental diagnosis of contagious pleuro-pneumonia of bovines, K. POPPE (*Arb. K. Gsndhtsamt., 45 (1913), No. 2, pp. 238–268, pls. 3, figs. 4*).—In localities where many cases of this disease occur the diagnosis is easily made, but in those where the cases are few, especially when the first ones occur, it is more difficult. The uncertainty of the anatomical method of diagnosis made it desirable to look for a means which rests on accurate experimental principles, consequently filtration, inoculation, and serum diagnostic tests were made in this direction.

The findings of Nocard and Dujardin and Beaumetz in regard to the filtration method for isolating the contagious pleuro-pneumonia virus were verified. In the study, tissues from other diseases such as tuberculous broncho-pneumonia, emphysema of the lungs, and normal lung tissue were included for comparison with the lung tissue and exudates from authentic cases of lung plague. The exudates, etc., were diluted with Martin's peptone bouillon.

With normal tissue or the tissue from cases in which the etiologic factor of lung plague was not present, the results of the filtration test showed the absence of the charactersitic opalescent clouding of the filtrate (culture) and no minute strongly refracting granules. Where material containing a considerable amount of blood, or material in a putrefying condition was used, a light opalescence was noted, but it was never so pronounced as that from the specific material. Culture tests with filtered exudates, etc., accompanied by inoculation tests with calves and smaller experimental animals supported the diagnosis of this disease. The complement fixation test did not give satisfactory results, but the

precipitation test in most cases was satisfactory, although the number of tests made were too few to draw a final conclusion.

On the basis of the results obtained the following criterions are considered of value for diagnosing the presence of lung plague in an animal: (1) The filtered lung—or thoracic—cavity exudates of the suspected animals must give the characteristic opalescent turbidity in Martin's peptone bouillon at 37° C. after five to seven days; (2) the virus obtained with the necessary precautions, when inoculated subcutaneously in the lower lip of calves, must show after four to five days a typical swelling at the site of injection accompanied by a rise in temperature (the fastigium is reached after the tenth to twelfth day); (3) the culture obtained from the filtered subcutaneous exudate from the inoculated calf must show the characteristic opalescent clouding; and (4) smaller experimental animals, treated with the lung—or thoracic—fluid or with the edematous fluid from inoculated calves must succumb to the infection.

Immunization of cattle against East Coast fever, A. THEILER (*Rpt. Dir. Vet. Research, Union So. Africa, 2 (1912), pp. 266–314; abs. in Jour. Compar. Path. and Ther., 26 (1913), No. 3, pp. 261–265*).—"The experience in the field indicates that the inoculation can be safely undertaken in respect of either clean or infected cattle with the prospect of conferring immunity on 56 to 60 per cent. The best results in the field may be expected from the injection of 5 cc. of spleen or gland pulp (medium, half-coarse, or coarse grain) mixed with aleuronat or peptone, such animals to be kept on clean veldt for 14 or 15 days before they are exposed to natural infection. The immunity conferred by the injection may not be absolute, inasmuch as twelve breakdowns were noted among the experimental animals, or 1 per cent. The animal which supplies the spleen or gland pulp for the inoculation has apparently an influence on the results, as the variation in the mortality from the injection can not be considered to be due to any other factor.

"As a possible improvement to the present method of immunizing cattle against East Coast fever, the saturation of the pulp in a solution of quinin hydrochlorid is suggested, the strength of the solution to be between 0.6 and 0.7 per cent."

Immunization of imported cattle against Northern Rhodesia piroplasmosis and anaplasmosis, F. CHAMBERS (*Jour. Compar. Path. and Ther., 26 (1913), No. 3, pp. 249–253*).—An account of two Ayrshire bulls affected with Northern Rhodesia piroplasmosis and anaplasmosis. Both were treated with Northern Rhodesia blood and various medicaments which included sodium sulphate, ammonium carbonate, citrate of iron and quinin, and sweet spirits of niter. One of the animals received 120 cc. of a 1 per cent solution of trypan blue. Both animals recovered.

The susceptibility of the pig to blackleg, S. VON RÁTZ (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 14 (1913), No. 1, pp. 1–8; abs. in Jour. Compar. Path. and Ther., 27 (1914), No. 2, pp. 175, 176*).—The author's experiments show that the pig does not possess an absolute immunity.

Hog cholera and preventive treatment, W. S. ROBBINS (*Michigan Sta. Spec. Bul. 65 (1914), pp. 5–22, figs. 11*).—This is a descriptive account of hog cholera and the manner of immunizing hogs against it.

Roaring in the horse, H. A. VERMEULEN (*Das Kehlkopfpfeifen beim Pferde. Utrecht, 1914, pp. 97, pls. 6, figs. 17; rev. in Jour. Compar. Path. and Ther., 27 (1914), No. 2, pp. 173, 174*).—The author considers this affection to be a symptom of a widespread disease affecting the motor nerves and their centers and not one localized in the larynx. The condition is considered as a poisoning, the poison being sometimes of mineral or vegetable origin but in most cases a bacterial toxin or an autotoxin, the last mentioned having its origin in dis-

turbance of the function of the thyroid gland. The author has attempted to treat the condition in horses through the administration of dried and powdered thyroid gland. Of 15 horses treated two are said to have been cured and four recognizably improved. Of the nine horses in which treatment failed four are said to have been very old.

Parasites and parasitic diseases of the dog and cat, L. G. NEUMANN (*Parasites et Maladies Parasitaires du Chien et du Chat. Paris, 1914, pp. X+348, figs. 156*).—The several chapters of this work deal with parasites of the skin, connective tissue and muscles, digestive system, serous membranes, respiratory system, circulatory system, brain and organs of sense, and genito-urinary organs.

Brief mention of parasites of the ferret is made in an appendix (pp. 337–340). A subject index is included.

Investigations of spirochetosis of fowls from Tunis and of Argas persicus, which transmits the disease. III, B. GALLI-VALERIO (*Centbl. Bakt. [etc.], 1. Abt., Orig., 72 (1914), No. 6–7, pp. 526–528*).—In this third memoir (E. S. R., 20, p. 1154; 22, p. 392) the author reports finding *A. persicus* which became infected with *Spirochæta anserina* to be free therefrom in from nine to ten months. *A. persicus* from Humt-Suk, island of Jerba, caused a fatal chronic disease in fowls six months after arrival at Lausanne. This tick is very resistant to high and low temperatures and can survive without food for 21 months.

The blood of the fowl in experimental spirochetosis, L. LAUNOY and M. L. BRUHL (*Ann. Inst. Pasteur, 28 (1914), No. 5, pp. 517–539, pl. 1, figs. 6*).—The infection of the adult fowl with *Spirochæta gallinarum* causes a rapid and marked anemia in which the erythrocytes are reduced in number by one-half in five days.

Investigations in regard to the blood cells of healthy and sick fowls and pigeons, E. HEDFELD (*Abs. in Deut. Tierärztl. Wchnschr., 21 (1913), No. 17, pp. 266, 267*).—The following kinds of white blood cells were noted: Eosinophil leucocytes with rod-like granulations, eosinophil leucocytes with grain-like granulations, large lymphocytes, small lymphocytes, and basophil leucocytes. The blood was taken from a wing vein. It was noted that in the birds hematoblasts occur, but the amount is greater under pathologic conditions. Neutrophil cells were never noted.

The absolute number of blood cells per cubic millimeter for erythrocytes was 4,000,000 and for leucocytes 24,000. The differential leucocyte count was as follows: Eosinophils with grain-like granulations, 26 to 30 per cent; eosinophils with rod-like granulations, 10 to 20; large lymphocytes, 12 to 13; small lymphocytes, 42 to 49; and basophil cells, 3 per cent. By treating the birds with either fowl cholera or erysipelas cultures the following blood picture was noted: Hypoleucocytosis followed by a hyperleucocytosis which went up to 101,000, and a rise in eosinophils up to 74 per cent. The birds were also fed with the heart muscle of a goose which died from fowl cholera. After infestation with round worms (*Ascaris megalocephala* and *A. suis*) the number of white cells was 125,000 and the eosinophils 74 per cent.

RURAL ENGINEERING.

A treatise on the law of irrigation and water rights, C. S. KINNEY (*San Francisco, 1912, 2. ed. rev. and enl., vols. 1, pp. XXXII+1097; 2, pp. XXVIII+1098–2194; 3, pp. XXV+2195–3146; 4, pp. XXI+3147–4558*).—It is the author's aim in this work to cover completely and exhaustively every phase of irriga-

tion and water-right law, and to make it, by way of comparison, world wide in its application. It is presented in four volumes and consists of 14 distinct divisions, which are as follows: Economic questions relating to irrigation and waters; ancient and modern irrigation; classification, definitions, and the nature of waters; rights of the public in waters and water courses; acquisition and disposal of lands and waters by the United States; the common law governing waters; the civil law governing waters; the appropriation of water for beneficial uses; the nature, extent, and character of rights acquired to water by appropriation, rights of way, and the pollution of waters; subterranean waters and rights acquired thereto; international, interstate, federal, state, district, and municipal control; control by private water companies; adjudication and protection of rights—injuries to rights and remedies therefor; and special features and statutory laws of the arid and semiarid States.

Elements of western water law, A. E. CHANDLER (*San Francisco, 1913, pp. 150*).—This book, intended for advanced students in agricultural or civil engineering, contains chapters on the following topics: Early development of the doctrine of appropriation, riparian rights in the Western States, the law of underground waters, the doctrine of appropriation, loss of water rights, water right legislation, water rights on interstate streams, rights of way over public lands for ditches and reservoirs, commercial irrigation enterprises, the desert land act and the Carey act, the reclamation act, irrigation ditches, and the desideratum in legislation regarding the public waters.

Water laws of the State of Oregon (*Salem, Oreg., 1913, pp. 195*).—The text of the state laws pertaining to irrigation, drainage, water-power development, and water supplies is given.

Hydraulics, E. H. SPRAGUE (*London, 1914, pp. 184, figs. 89; rev. in Engin. Rec., 69 (1914), No. 18, p. 514*).—This is a text-book for students and engineers containing chapters on the principles of fluid pressure; liquids in motion; discharge through orifices, weirs, etc.; flow in pipes and channels; and the pressure of water and its application to motors and pumps.

Station of rural engineering and agricultural hydraulics: [Report of tests], R. GAGEY (*Bul. Dir. Gén. Agr. Com. et Colon. Tunis, 17 (1913), No. 71, Sup., pp. 53–87*).—Tests at the station extending from 1898 to 1912 on a large number of agricultural machines and motors, including animal power, and experiments in soils and agricultural hydraulics are briefly reported.

Report of state engineer, Colorado, 1911–12, C. W. COMSTOCK (*Bien. Rpt. State Engin. Colo., 16 (1911–12), pp. 363, pls. 10*).—This report gives information on water appropriation and distribution and includes hydrographic and flood data and data on pumping for irrigation, particularly from wells.

Drainage and irrigation: The duty of water, L. SCHMEER (*Engin. and Contract., 41 (1914), No. 16, pp. 478–481, fig. 1*).—The author defines the duty of water, and discusses it under the heads of net duty, influence of methods of irrigation on net duty, methods of estimating net duty, percolation, gross duty, and method of estimating gross duty. Tables and formulas are included.

Measurement of flowing streams, R. R. LYMAN (*Utah Engin. Expt. Sta. Bul. 5 (1912), pp. 18, pls. 2, figs. 3*).—This bulletin presents in popular language a simple method for using the weir, and is designed for the use of irrigators and others concerned in the measurement of flowing water. Tables of discharges in second-feet per foot of weir and of weir dimensions and discharge diagrams are appended.

An investigation of the use and rating of the current meter, C. P. RUMPF (*Engin. News, 71 (1914), No. 20, pp. 1083, 1084, figs. 4*).—Rating curves from tests of screw and cup current meters under ordinary conditions of movement

parallel with the stream flow, and also to show the effect of cross-currents at angles with the stream flow, are given.

A comparative rating curve of the two meters shows that both give practically a straight line, but the results from the screw type are slightly more consistent. When turned at angles varying from 0 to 90° by increments of 10° with the stream flow, the revolutions of the screw meter were decreased almost proportionately to the number of degrees turned, while the revolutions of the cup meter were increased when turned with its head to the left and decreased when turned to the right. Both meters followed their regular rating curves in all ordinary depths, but when brought nearer the surface than 1 ft., measuring from the center of the wheel, the revolutions of both were decreased, and when brought nearer the bottom than 6 in. the revolutions of the cup meter were decreased and those of the screw meter increased.

The revolutions of the cup meter were increased if the open part of the cups was near the side of the tank as the meter advanced, but were decreased if the point of the cups was near the side. The side swaying of the rating car decreased the revolutions of the screw meter and increased those of the cup meter. Rating the screw meter backwards decreased its revolutions. When the meters were only partially covered, as in very shallow water, the curves were very eccentric. Curves for the cup meter were the same whether or not the tail was attached.

See also a previous note by Scobey (E. S. R., 31, p. 288).

Methods of finding center cut for economic locations of banked irrigation ditches, F. C. Snow (*Engin. and Contract., 41 (1914), No. 16, pp. 481, 482, figs. 3*).—Formulas and methods for computing diagrams for determining the center are given, with a sample diagram.

Centrifugal pumps for irrigation, C. F. Braun (*West. Engin., 3 (1913), No. 2, pp. 124–138, figs. 14*).—It is the purpose of this article "to point out a few features, which, if carefully regarded, make the centrifugal pump a highly efficient, very reliable unit, capable of delivering water at surprisingly low cost, and of competing with gravity canal systems."

The author deals with the design of both turbine and volute pumps, discussing multi-stage pumps, centrifugal pump limitations, multi-impeller pumps, mechanical details, clearance bushing rings, hydraulic-balance, thrust-bearing, materials of construction, pump characteristics, methods of drive and installation, and cost.

Irrigation, J. L. Coulter and R. P. Teele (*Thirteenth Census U. S., 5 (1910), pp. 827–876, pl. 1, figs. 15*).—This is a more extensive report of work previously noted (E. S. R., 28, p. 888).

Irrigation pumping in Nevada, C. A. Norcross (*Nev. Bur. Indus., Agr., and Irrig. Bul. 8 (1913), pp. 78, figs. 35*).—It is the purpose of this bulletin to show the practical outlook for irrigation pumping in Nevada within lifts of 50 ft. In dealing with the underground water supply the general principles governing surface and artesian water are discussed from the standpoint of pumping. Methods of computation of the cost of pumping water are described, and tables are given of the cost per irrigated acre with different kinds of power and at pumping lifts up to 50 ft. In dealing with pumping efficiency and types of pumps the several kinds of pumps adapted to low-lift irrigation pumping are discussed. A final section dealing with wells, pits, and reservoir construction gives practical information in relation thereto, including the cost of drilling artesian wells.

Irrigation, C. H. Pead (*Proc. Rhodesia Sci. Assoc., 12 (1913), pt. 3, pp. 152–161*).—The author attempts to point out the economic possibilities of irrigation in Rhodesia.

Drainage, LESSMANN (*Illus. Landw. Ztg., 34 (1914), No. 30, pp. 289, 290, figs. 7*).—This is a discussion of land drainage from the German viewpoint, giving information as to depth and distance between drains in different soils.

Moor drainage, A. VON VEGESACK (*Mitt. Balt. Moorver., 3 (1913), No. 1–2, pp. 63–84, figs. 2*).—The author discusses the economic importance of swamp-land drainage, methods, and related subjects, and reports drainage experiments conducted in 1911 and 1912 on an undecomposed lowland swamp soil of uniform chemical composition and varying in depth from 4 to 6 meters (13.1 to 19.7 ft.). Sixteen drainage combinations were tested, the depths being 90 and 130 to 135 cm., the distance between drains 15, 20, 30, and 40 meters, and the types of drain being clay tile and poles. Only the ground water level movements midway between drains during the different seasons are so far reported.

The following tables show the depths of ground water level as established by the different drainage combinations:

Position of water table with 90 cm. drainage depth.

Distance between drains.	Middle of May.		Middle of June.		Middle of July.		Middle of August.		Middle of September.		Average.	
	Pole drain.	Tile drain.	Pole drain.	Tile drain.	Pole drain.	Tile drain.	Pole drain.	Tile drain.	Pole drain.	Tile drain.	Pole drain.	Tile drain.
Meters.	*Cm.*	*Cm.*	*Cm.*	*Cm.*	*Cm.*	*Cm.*	*Cm.*	*Cm.*	*Cm.*	*Cm.*	*Cm.*	*Cm.*
15	68.4	62.9	65.8	61.8	79.0	72.1	79.4	72.1	65.6	62.7	71.6	66.3
20	70.0	64.0	65.6	59.8	79.5	73.6	81.1	72.9	65.3	62.1	72.3	66.5
30	62.8	62.9	58.3	59.6	77.6	75.5	78.9	74.3	59.0	60.0	67.3	66.5
40	61.0	63.2	54.7	60.4	76.2	77.9	78.1	83.6	55.0	59.8	65.0	68.9

Position of water table with 130 to 135 cm. drainage depth.

Distance between drains.	Middle of May.		Middle of June.		Middle of July.		Middle of August.		Middle of September.		Average.	
	Pole drain.	Tile drain.	Pole drain.	Tile drain.	Pole drain.	Tile drain.	Pole drain.	Tile drain.	Pole drain.	Tile drain.	Pole drain.	Tile drain.
Meters.	*Cm.*	*Cm.*	*Cm.*	*Cm.*	*Cm.*	*Cm.*	*Cm.*	*Cm.*	*Cm.*	*Cm.*	*Cm.*	*Cm.*
15	80.5	89.0	79.4	88.4	89.5	116.1	88.1	119.2	74.8	87.0	82.5	99.9
20	77.9	92.7	72.6	87.1	87.4	105.4	90.8	113.5	70.8	95.1	80.9	98.8
30	60.7	83.9	57.3	79.0	88.4	102.4	85.5	114.7	59.1	88.0	70.2	93.6
40	51.7	52.6	48.0	56.1	79.4	89.6	83.6	96.0	56.8	65.0	63.9	71.9

The ground water level reached a position of equilibrium more quickly and fluctuated less with the shallower than with the deeper drainage, and with deeper drainage it rose higher in wet periods and sank lower in dry periods. With deeper drainage the tile drains had a more intensive effect than the pole drains, and only in case of sudden heavy rainfall did the water level rise higher with the tile than with the pole drains. The tile were on the whole the more effective at both drainage depths, and at all distances between drains except with the shallow drains 15 meters apart.

Blasting experiments with agricultural dynamite, H. VON FEILITZEN (*Svenska Mosskulturfor. Tidskr., 27 (1913), No. 3, pp. 262–281, figs. 10; 28 (1914), No. 1, pp. 29–34, figs. 3; abs. in Mitt. Balt. Moorver., 3 (1913), No. 4, pp. 205–207*).—Experiments in subsoiling, soil drainage, and stump removal by blasting are reported.

Blasts in a sandy soil overlying a hardpan with the holes spaced 15 ft. apart and bored through the hardpan pulverized the soil within a radius of 1 to 2

meters, but beyond that the hardpan was intact. Drainage experiments in brush-covered sand soil and in upland moors were fairly successful as were also stump blasting experiments. It is concluded that blasting is an effective process for ditch digging, tree planting, and stump removal, and that the value of subsoil blasting will depend upon the original productiveness of the soil, the gain in productiveness, and the cost of the operation.

Laws of Missouri relating to roads, highways, and bridges, 1913, C. ROACH (*Jefferson City, Mo., 1913, pp. 136+XIII*).—A text of these laws is given.

Design and construction of earth roads in Iowa, T. R. AGG (*Engin. News, 71 (1914), No. 16, pp. 821–825, figs. 10*).—The author deals with the work of the Iowa Highway Commission relative to the improvement of earth roads. The cross-sections adopted for these roads are illustrated and explained, and the limiting grades are given together with recommendations for alignment at railway grade crossings and on curves. The use of the elevating grader is explained, and the cost of road work done by this machine and equipment in Iowa is given.

Forms for concrete work, A. GRAHAM (*Abs. in Concrete and Construct. Engin., 9 (1914), No. 5, pp. 339–344*).—Brief specifications are given for forms for concrete work in general and for silos and bridges in particular.

Knots, hitches, and splices, H. W. RILEY (*Cornell Reading Courses, 1 (1912), No. 8, pp. 45–88, figs. 201*).—It is the purpose of this pamphlet to show "as clearly as possible each step in the quickest and easiest methods of making such knots, hitches, and splices as will be found most generally useful."

Economical selection of belts and pulleys, W. F. SCHAPHORST (*Power, 39 (1914), No. 17, pp. 588–590, figs. 4*).—Data are given pertaining to the selection of pulleys and belts for the purpose of obtaining the best results with the least initial cost. Tables and curves are empolyed to assist in making a determination of pulley and belt sizes.

Standard American gas and oil engine, automobile, and farm engine guide, STEVENSON and BROOKES (*Chicago, 1913, pp. 719+232+243, pls. 4, figs. 487*).—This is an encyclopedia of the construction and operation of gas and oil engines, containing information on questions relating to the care, construction, and operation of gasoline and electric automobiles, farm and traction engines, and a threshing machine, including a full description of its various parts and their uses. Questions and answers for examination when applying for an engineer's license are also given.

Working up a boiler test, F. R. LOW (*Power, 39 (1914), No. 17, pp. 592–595*).—An efficiency test is worked up item by item in which some of the more important features are the reduction to a dry coal and combustible basis; how to find the evaporation per pound of coal as fired, per pound of dry coal, or of combustible material under actual conditions, or from and at 212° F.; and different boiler efficiencies, boiler horsepower, and cost per 1,000 lbs. of steam.

A graphic representation of traction efficiency resulting from practical tests and experience (*Farm Machinery, No. 1175 (1914), p. 19, fig. 1*).—A curve showing the traction efficiency of the tractor, the percentage of slip of drive wheels, and the number of plows, shows that with a 20,000-lb. tractor under average conditions the slip with 2 plows is 1 per cent; with 8 plows, 8 per cent; with 10 plows, 20 per cent; and with 12 plows, 38 per cent. With 14 plows the tractor does not move, but spins the drivers.

The modern gas tractor, its construction, operation, application, and repair, V. W. PAGE (*New York, 1913, pp. 475, pls. 3, figs. 201*).—This is a nontechnical treatise intended as a guide for the average farmer and mechanic, in which the endeavor has been made to present some principles of design of

the gas tractor. It is the author's purpose to discuss the engineering features of various constructions only with a view of familiarizing the reader with the salient points of design so that the advantages of the various systems of construction may be intelligently analyzed and the mechanism best adapted to individual requirements be selected.

The subject matter is presented under the following chapters: The scope, advantages, and applications of power traction; review of conditions on which tractor design is based; design and construction of gas tractor power plants; gas tractor power-plant components; making and exploding the gas; cooling and lubricating the power plant; functions and construction of clutch, gear set, and differential; the tractor frame, wheels, and axles; driving and housing the traction engine; traction-engine troubles and their elimination; and miscellaneous rules and formulas.

Plowing by electricity in Italy, L. J. KEENA (*Daily Cons. and Trade Rpts. [U. S.], 17 (1914), No. 90, pp. 316, 317*).—Data are quoted which show that electrical power for plowing, when secured at 3, 4, and 5 cts. per kilowatt hour, is considerably cheaper than steam or animal power.

Electricity for country houses (*Sci. Amer. Sup., 77 (1914), No. 2000, pp. 287, 288*).—The subject is discussed from the English standpoint, dealing particularly with the generator and accumulator and quoting prices.

Report of the departmental committee on the probable duration of buildings and other works for small holdings (*London: Bd. Agr. and Fisheries, 1912, pp. 21*).—Numerous inspections made in England and Wales on buildings, fences, and roads for small farms are reported. A large proportion of the timber buildings and fences which have been in existence for from 20 to 80 years were found to be in good condition. The report favors the use of corrugated galvanized iron in the construction of farm buildings.

The dwelling and the dampness of the dwelling, H. STEINBERGER (*Die Wohnung und die Wohnungsfeuchtigkeit. Berlin, 1914, pp. 116, figs. 17; rev. in Gsndhts. Ingen., 37 (1914), No. 12, p. 225*).—This book, intended for tenants, house owners, architects, and engineers, treats of the sanitary aspects of house location and construction, with particular reference to dampness in walls and atmosphere, and the insanitary conditions resulting therefrom. Various methods of preventing dampness and the growth of injurious fungi are considered, including a discussion on heating and ventilation.

Homemade silos, H. RABILD, A. K. RISSER, and K. E. PARKS (*U. S. Dept. Agr., Farmers' Bul. 589 (1914), pp. 47, figs. 37*).—This discusses the general considerations regarding silos, points out the essential features in their construction, and gives detailed instructions for building the concrete, stave, and the modified Wisconsin silo. The part relating to the stave silo is a revision of a previous circular (E. S. R., 20, p. 688). It is pointed out that to make the silo a profitable investment one should have at least ten cows or their equivalent in other stock owing to the cost of the silo and the silo-filling machinery.

The concrete silo is said to have the advantage of the other two types in permanency and stability but is, as a rule, more expensive. The stave silo is cheap and easily and quickly constructed, but it is a temporary structure lasting only from 5 to 15 years, depending on the kind and quality of lumber used in its construction, and the climate. It is considered to be more liable to blow down, fall down, or otherwise get out of repair than either of the other types of silos. The modified Wisconsin silo is said to be more substantial than the stave silo and is recommended for sections where it is inconvenient to secure hoops or lugs for stave silos. The two objections to this type of silo

are that it is difficult to build with a diameter less than 14 ft. and that it has an unfinished appearance.

Four cheap silos, C. I. Bray and D. R. Forrester (*Oklahoma Sta. Circ. 33 (1914), pp. 16, figs. 14*).—This circular gives information regarding the construction of (1) the homemade 2×6 stave silo, (2) the flooring silo with wooden hoops, (3) pit silos, and (4) the homemade concrete block silo.

Lightning rods, W. H. Day (*Ontario Dept. Agr. Bul. 220 (1914), pp. 38, pl. 1, figs. 39*).—This bulletin describes and analyzes lightning action and the lightning discharge and stroke with reference to buildings, fences, animals, and human beings. It describes the principles of lightning rods and gives directions for their proper installation on farm buildings. It is concluded from the results of extended investigations "that lightning rods properly installed are almost absolute protection against lightning."

Domestic refrigeration (*Lait. Belge, No. 4 (1914), pp. 37–43, figs. 2*).—A description and general data are given concerning small refrigeration plants designed especially for use in homes and restaurants and in which the refrigeration is obtained by means of an electrically operated carbon dioxid compressor.

A comparative study of circular and rectangular Imhoff [sewage] tanks, T. S. Johnson (*Bul. Sci. Labs. Denison Univ., 17 (1914), Art. 9, pp. 341–367, figs. 5*).—This thesis attempts an economic design of two Imhoff sewage tanks as applied to the disposal plant of a small community and makes comparisons of rectangular and circular tanks with special regard to costs and clarification efficiency. The comparison of cost data only slightly favors the circular tank, and the author concludes "that the advantage of the circular radial-flow type of Imhoff tank over the type known as rectangular-linear flow must lie mainly upon its advantages as to clarification efficiency. And here, too, enough questions will arise to make the problem one that can be best solved for each location or installation."

A bibliography is appended.

[Telephony in rural districts] (*Electrician [London], 72 (1914), No. 25, pp. 1035–1038, figs. 6; abs. in Elect. World, 63 (1914), No. 17, p. 947*).—This is an illustrated article on the Steidle telephone system in use in Germany. There are used a manual main exchange and automatic subexchanges.

The loose leaf drafting manual, C. B. Howe (*New York and London, 1913, pp. 82, figs. 146*).—A number of exercises in machine and agricultural drafting are given.

RURAL ECONOMICS.

Depopulation of rural districts, E. Laur (*Fühling's Landw. Ztg., 63 (1914), Nos. 1, pp. 1–22; 2, pp. 53–62*).—The author, by a study of the peoples of various countries whose population aggregates over 350,000,000 persons, shows than the urban population is increasing faster than the rural, so that the rural population forms a decreasing proportion of the total. It is only in the older countries, however, that there has been an actual decrease in the rural population. Some of the causes contributing to the migration of people from rural districts are low wages, long hours of work, and the lack of social standing, outlook for the future, amusements, and opportunity for marriage. In many instances there is no provision for old age nor chances for making a large income such as are found in the cities. In many cases the influence of the school does not tend to build up the rural community.

The progress of the small holdings movement (*Bd. Agr. and Fisheries [London], Ann. Rpt. Proc. Small Hold. and Allot. Acts [etc.], 1913, pt. 1, pp. 58; abs. in Jour. Bd. Agr. [London], 21 (1914), No. 2, pp. 157–159*).—Since the

passage of the Small Holdings Act for England and Wales, applications for small holdings have been made to the county councils by 43,245 individuals and 89 associations, and the total quantity applied for amounts to 723,497 acres. Of the individual applicants, 25,567 have been provisionally approved as suitable and 17,005 of them have obtained holdings. Only 24 per cent of the applicants in 1913 were agricultural laborers. Only a very small percentage of the applicants have expressed a desire to purchase holdings.

The interest of the individual in the operations of large farms, G. SCHULZE (*Landw. Jahrb., 46 (1914), No. 1, pp. 41–88*).—The author discusses various means that can be employed to arouse an interest among the workers on large agricultural establishments similar to that of ownership. Among the means mentioned are premiums or supplementary wages, sharing in the profits, and the working up of rivalry by assigning a portion of the farm to an individual or a group of individuals. In the care of animals he found a natural pride that is easily stimulated by the use of any of the above means. A brief bibliography is included.

Increasing the efficiency of workers, AEBEHOE (*Deut. Landw. Presse, 41 (1914), No. 46, pp. 563, 564*).—The author calls attention to the fact that the labor supply is one of the most serious of the agricultural problems. He suggests that by the use of the Taylor system the methods of performing farm operations might be improved and the effectiveness of the worker increased.

[Condition of country women], G. SCANNI (*Bol. Quind. Soc. Agr. Ital., 19 (1914), No. 9, pp. 313–327*).—This article contains abstracts from answers to a questionnaire sent out by the Italian Agricultural Society to ascertain the types of work performed by women on farms and the extent of their migration.

Yearbook of international cooperation, H. MÜLLER (*Ann. Mouv. Coop. Internat., 2 (1912), pp. VI+299, pl. 1*).—This is a French edition of this yearbook, previously noted (E. S. R., 30, p. 693).

Proceedings of the third provincial cooperative conference held at Mysore (*Proc. Prov. Coop. Conf. Mysore, 3 (1913), pp. 100*).—Among the various papers presented at this conference were the following: Cooperation and State Aid by N. M. Rau; Cooperation in its Relation to Agriculture by Dr. Coleman; Cooperative Movement and the Development of Agriculture by K. S. Rau; Cooperative Credit—Why it Has Taken Root in India in Preference to Other Forms of Cooperation by A. V. Ramanathan; Cooperative Banking Unions by H. Ramachandriah; and Mutual Cattle Insurance Societies in Burma.

The private control and the intervention of the State in matters relating to cooperation, B. MICHEL (*Egypte Contemporaine, No. 19 (1914), pp. 377–412*).—This article gives a brief history and description of the development of cooperative organizations and the function of the State in regard to their control in Germany, England, France, Italy, Roumania, Algeria, and British India.

Report on rural credits and cooperation, J. CUNNINGHAM and W. M. BROWN (*Columbus, Ohio, 1914, pp. 85*).—The authors describe the development of rural credit and cooperation in European countries and its present status in Ohio.

They found that the agricultural credit conditions in Ohio were not satisfactory, in that a high rate of interest is charged, and the amortization plan of repayment is not employed. A number of cooperative associations were found but their number could be extended to the advantage of the farmer. They recommend that a bureau of markets be established and outline as some of the functions to be performed by it the promotion of efficiency and economy in production and distribution; furnishing information on cooperation, accounting and business methods, and legal rights and duties of cooperative agencies; drafting model by-laws for cooperative societies; establishing city markets for

farm produce; and investigating the practice of commission merchants. As appendixes to their report they give the constitution and by-laws of different types of cooperative organizations.

[Laws of Indiana relating to rural loan and savings and building and loan associations] (*Indianapolis: State, 1914, pp. 12+29*).—There have been brought together in this pamphlet the laws regarding the building and loan associations and those relating to rural loans and savings associations.

Cattle loan banks, J. F. EBERSOLE (*Jour. Polit. Econ., 22 (1914), No. 6, pp. 577–580*).—The cattle loan company is a middleman between the borrowing cattle owners and the lending bank manager. It deals principally with large cattle growers. When a loan is desired the company sends an examiner who passes upon the plant, the cattle, and the business capacity of the cattle grower. If the request is acted upon favorably a promissory note and a chattel mortgage are taken. The notes are indorsed by the company and sold and become equivalent to a "debenture" issued by a pledge of specified assets held by the company for the protection of the note holders. The rate charged the borrower on this type of paper ranges from 7 to 10 per cent, of which the purchaser receives 5 to 6 per cent on his money and the remainder goes to the loan companies.

The cooperative insurance of pigs (*Bd. Agr. and Fisheries [London], Coop. Ins. Pigs, 1914, pp. 9+16+8+13*).—This report states that in 1908–9 less than 2 per cent of the pigs in Great Britain were insured. The experience of societies in insuring pigs shows that the average net income from insurance contributions is less than 2s. per pig per annum. The report also includes model rules for registered and unregistered rural cooperative pig insurance societies and gives an explanation of the rules.

Cooperation among farmers, especially in marketing, A. W. SANBORN (*Wis. Bd. Agr. Bul. 2 (1913), pp. 16*).—The author contends that since the farmer has but a small amount of any one product to market, he can not sell it to the best advantage by operating alone. After noting the influence of cooperation in European countries, he calls attention to some of the essentials for success. Among those mentioned are an agreement whereby the members promise to furnish the cooperative societies their entire products for a stated period; a capable manager; a good system of accounting; proper arrangements for grading the produce; and the adoption of the principle of one member one vote. Some of the benefits to be derived from cooperation are its educational influence, increased efficiency in production, better market for agricultural products, and a greater share in the profits of distribution.

Consumer's view of producers' organizations, RUBY G. SMITH (*Farm Poultry, 25 (1914), No. 6, p. 111, fig. 1*).—The author believes that organized producers cooperating with organized consumers will establish more economical methods for transporting, storing, selling, and delivering farm produce. The consumer will welcome standardized goods at lower prices, honestly weighed and measured.

Theoretic basis of the statistics of international statistics of agriculture, U. RICCI (*Les Bases Théoriques de la Statistique Agricole Internationale. Rome: Inst. Internat. Agr., 1914, pp. XII+314, figs. 8*).—The International Institute of Agriculture is attempting to devise a method whereby the area and production statistics as gathered by the various nations may be so modified or reported as to obtain uniformity and accuracy in making summary statements. The author outlines the classification of land according to its agricultural uses and the methods of reporting conditions and yields of agricultural crops. He decides that the system whereby the facts are expressed as a varia-

tion from 100, using the average for the last 10 years as a basis, is the one best adapted to their purpose.

Statistical annual for 1914, E. G. OSMAN (*Price Current-Grain Rptr. Statis. Ann. 1914, pp. 56*).—This report contains statistical data showing the quantity of meats packed, prices of meat, meat products, and live stock, and their movement at the principal centers of the United States, and for a series of years. The production, movement, and prices of grain are also shown.

A geographic study of the growth and distribution of population in Michigan, O. W. FREEMAN (*Rpt. Mich. Acad. Sci., 15 (1913), pp. 39–53, figs. 11*).—The author shows that between 1900 and 1910 the number of persons in rural districts decreased in 45 of the 82 counties in the State. The cause for this decrease is that not only are the younger generation leaving for the cities but there is a decrease in the average size and in the number of families. He includes a series of maps showing the density of the population by counties, beginning with 1820.

Michigan agriculture, its present status and wonderful possibilities, R. S. SHAW (*Michigan Sta. Spec. Bul. 70 (1914), pp. 3–23, figs. 8*).—This bulletin is a digest of the information obtained by the Thirteenth Census concerning agriculture.

The author points out that 51.5 per cent of the total land area is in farms and 67.8 per cent of the land in farms is improved. Among the principal conditions which have retarded the agricultural development have been the large areas covered with heavy timber, the sand areas, and much land that needed drainage. In spite of these handicaps, the author considers that Michigan has made a very favorable progress. He calls attention to the wide range of crops and live stock produced in the State and the relative importance of Michigan in the production of each. A single tabular statement consolidating practically all the statistics collected by the last census of agriculture by counties is appended.

Report of the Grain Markets Commission of the Province of Saskatchewan (*Rpt. Grain Markets Com. Saskatchewan, 1914, pp. 150+III, pls. 2*).—Among the conclusions reached by this commission were that exclusive grain raising as practiced by even the best farmers is not renumerative, that it costs the farmers more to have the exportable surplus of western Canada grain crops placed on the present ultimate market than the farmers of any other large exporting country have to pay, and that all terminal and transfer elevators as well as internal terminal storage elevators should be owned and operated by the Dominion Government as some already are. It recommends that every possible encouragement be given to bring about greater diversity in the products of the farms, that there be a reorganization of agricultural credit facilities, an extension of cooperative marketing, improved transportation facilities, and the storage of grain on the farms instead of public warehouses.

Future of tropical America (*London, 1913, pt. 2, pp. III+60, pls. 49*).—This is a continuation of the publication previously noted (E. S. R., 29, p. 896), and contains information concerning the West Indian Islands.

Agriculture of Argentina, 1912–13, E. LAHITTE (*Estad. Agr. [Argentina], 1912–13, pp. 187*).—This report contains statistical data showing for 1872, 1888, 1895, and 1912 the population, length of railroads, total area cultivated, and area in principal crops. There are also shown for 1911–12, with comparative data for earlier years, the area, production, amount of seed used, and amount exported and consumed at home for wheat, flax, corn, and oats, the number and value of agricultural implements imported, and other data concerning the manufacture of agricultural products and the number and movement of live stock.

The agriculture of Netherlands, 1813–1913 (*De Nederlandsche Landbouw in het Tijdvak 1813–1913, The Hague: Dept. Landb. [1913], pp. VII+465*).—This book contains a number of articles concerning the development of agriculture in Netherlands during the last 100 years. Among the more important articles are Legislation Concerning Agriculture, by L. E. J. F. Mollerus; Agricultural Associations, by C. G. J. A. van Genderen Stort; Agricultural Cooperation, by G. J. Bieleman; The Cultivation of Field Crops and Grass Land, by H. K. H. A. Mayer Gmelin and T. J. Mansholt; The Breeding of Cattle, by L. Broekema; The Breeding of Horses, by A. W. Heidema; and The Breeding of Small Animals, by F. B. Löhnis.

Commerce in agricultural products, fruits, vegetables, and flowers, E. Poher (*Le Commerce des Produits Agricoles, Fruits, Légumes, Fleurs. [Paris], 1912, pp. 498, figs. 128*).—The author gives a detailed description of the organization of markets, cooperative selling, methods of packing, transportation and rates, preservation, prevention of fraud, and international markets and French commerce. A large number of illustrations are given showing various types of containers and other phases in the distribution of the above products.

Agricultural statistics of Denmark (*Danmarks Statis. Meddel., 4. ser., 42 (1914), No. 1, pp. 63*).—Contained in this report are statistical data showing by minor subdivisions the total yield and value of farm crops. For Denmark as a whole, comparative data are shown for earlier years.

[The agriculture of the Belgian Congos]. H. Büchel (*Tropenpflanzer, Beihefte, 15 (1914), No. 4–5, pp. 329–374*).—The author describes the various types of agricultural plants and animals found in this country and discusses various phases of the trade in palm nuts and oil, India rubber, and ivory.

AGRICULTURAL EDUCATION.

Report of the Royal Commission on Industrial Training and Technical Education (*Roy. Com. Indus. Training and Tech. Ed. [Canada], Rpt. 1913, pt. 1–2, pp. XIV+437; pt. 3, vols. 1, pp. XXII+443–1011+XVIII, figs. 56; 2, pp. XXIV+1011–1633+XV, figs. 93; pt. 4, pp. XXV+1639–2354+XXIX*).—This is the report of the commission already discussed editorially (E. S. R., 31, p. 401).

Among the provisions recommended by the commission as necessary in a system or systems of industrial training and technical education for Canada are the following for rural communities: (1) Intermediate rural classes or schools with 2-year courses of from five to seven months each and the rest of the year at a farm or home. (2) Rural high schools offering 4-year courses, the first two of which would be similar to the intermediate rural school with the exception that each school year might be longer. Science subjects should be taught particularly in relation to their application to rural work and problems and the principles underlying the systems, methods, and operations of farming and housekeeping. They should prepare students for engaging in rural occupations and housekeeping and for admission to agricultural, housekeeping, and arts colleges. In both these types of schools for pupils having completed the elementary school, the work should provide for a series of experiences in proper sequence relating to the conditions of farming and housekeeping in the area served. (3) Resident or traveling county or district instructors for farming to act as advisers in coordinating the school work and farm projects carried on at home by pupils attending the intermediate rural schools and rural high schools; to arrange for short courses for young men not attending these schools; to provide systematic short demonstration courses in soils, live stock, farm machinery, etc., for adults, and to become associated with the work of a neighbor-

hood improvement association and an illustration farm for the locality, similar to those arranged for by the committee on lands of the Commission of Conservation. (4) Resident or traveling district instructresses in housekeeping to meet a class of women arranged for by a women's institute or other similar organization in the locality, one-half day a week for a term of 20 weeks, and to carry on work for the other half of the same day with the girls and teachers in an elementary, intermediate, or high school of the locality, to act in an advisory capacity as coordinators for housekeeping projects carried on at home by pupils of the intermediate rural schools and the rural high schools, and to provide demonstration lectures in cooking and housekeeping. (5) County or district agricultural and housekeeping residential schools for students 17 years and over with 1 or 2-year courses and also short courses of from one to three months in special subjects and industries. The courses should provide for a series of experiences in proper sequence to enable students to acquire a wider knowledge of the principles underlying the systems, methods, operations, and processes of their special occupation and a wider range of knowledge and skill in the actual management of soils, crops, live stock, products, and homes, in the use of machines, tools, and utensils, and in the making of things. (6) Young people's social service schools similar to the people's high schools of Denmark. (7) Schools for agricultural apprentices, necessary only in those portions of Canada where settlement is comparatively new, which would pay particular attention to the training of pupils in manual dexterity in the ordinary farm operations, such as plowing, seeding, stacking, threshing, etc. (8) Agricultural and home economics colleges. (9) Correspondence study courses in connection with agricultural and housekeeping colleges or other central institutions.

Vocational education in Indiana (*Dept. Pub. Instr. [Ind.], Ed. Pubs., Bul. 6 (1914), pp. 48*).—The purpose of this bulletin is to give information to superintendents and local school boards relating to the establishment and administration of state-aided vocational schools. It treats of the problem of vocational education in Indiana, constructive provisions of the vocational education law, the function, work, and kinds of vocational schools, their organization and administration, and a copy of the Indiana vocational education law of 1913.

Regulations governing vocational agricultural schools and departments in Indiana (*Dept. Pub. Instr. [Ind.], Ed. Pubs., Bul. 7 (1914), pp. 15*).—This bulletin gives information concerning the establishment of vocational agricultural schools and departments in accordance with the provisions of the Indiana vocational education law of 1913.

Agriculture and domestic science in the Harlem (Ill.) Consolidated School, C. C. BURNS (*Atlantic Ed. Jour., 9 (1914), No. 8, pp. 300–302*).—A detailed description is given of the instruction, following a course in nature study beginning in the first grade, including agriculture in this school in the seventh and eighth grades and four years of the high school, and home economics in the seventh and eighth grades and continuing through three years of the high school.

The Farragut School, A. C. MONAHAN and A. PHILLIPS (*U. S. Bur. Ed. Bul., No. 49 (1913), pp. 23, pls. 6*).—Following a history of the school the authors describe the buildings, equipment, school grounds, curriculum, community service, and results of the Farragut High School, at Concord, Tenn., which represents a most successful attempt at adapting the organization, work, and ideas of the country school to the needs of country life. A list of the agricultural, carpentry, sewing, and cooking equipment of the school is appended.

School gardens at St. Paul, Minn., E. L. FINNEY (*Rural Educator, 3 (1914), No. 4, pp. 73, 74, figs. 5*).—Notes are given by the director of school gardens on the school and home garden work in St. Paul, where school gardens were con-

ducted in 15 centers with an enrollment of over 1,200 children. The per capita cost per month of the gardens was 36 cts. They are operated for the benefit of children in the fourth grade only. Children above this grade must have home gardens.

The third annual report of the School Garden Association of America (*Ann. Rpt. School Garden Assoc. America, 3 (1914), pp. 16, figs. 6*).—Reports of the president, treasurer, and secretary of the association are given.

The University Home and School League (*Bul. Univ. Tex., No. 322 (1914), pp. 62*).—The University Home and School League, which is fostered by the department of extension of the University of Texas, has for its object closer cooperation of the school, the home, and the church of the community for mutual improvement. Its purposes, organization, and activities are outlined. Suggestions to the program committee and references to literature on social center work and rural life are also given.

Extension work of the Louisiana State University, A. F. KIDDER (*Rice Jour. and South. Farmer, 17 (1914), No. 4, pp. 1, 2*).—The author gives an account of the various phases of the agricultural extension work of the university.

Boys' and girls' clubs, W. R. HART and O. A. MORTON (*Boston: Mass. Bd. Agr., 1914, pp. 32, pls. 8*).—This publication contains a brief history of the boys' and girls' clubs in Massachusetts from 1908 to 1913, inclusive, lists of premiums, rules governing clubs and contests, and suggestions for the organization and promotion of boys' and girls' club work.

The pig clubs of the South, B. W. CURRIE (*Country Gent., 79 (1914), No. 16, pp. 786, 787, 808, figs. 5*).—An account is given of the boys' and girls' pig club work in Louisiana and Georgia.

Agricultural education in Latin America, C. D. SMITH (*Proc. Soc. Prom. Agr. Sci., 34 (1913), pp. 73–94*).—The systems of agricultural education in Brazil, Uruguay, Argentina, Peru, and Chile are described.

The educational system of rural Denmark, H. W. FOGHT (*U. S. Bur. Ed. Bul., No. 58 (1913), pp. 46, pls. 6*).—The educational system of rural Denmark is outlined in detail as the result of a personal investigation by the author.

Instruction in nature study is given in the first seven or eight grades. In the four years after leaving the elementary school the children learn practical agriculture and household duties at home or are apprenticed at recognized model farms where they get the benefit of the knowledge of specialists in farm science maintained in the field at state and local expense. Statistics for 1906 show that 33 per cent of all young men, and a slightly smaller number of young women, of 18 years and over, attend the folk high school for a longer or shorter period, while 14 per cent of the young men attend special agricultural schools in addition to the agricultural studies offered in many of the folk high schools and a considerable number of young women attend the special domestic-science schools.

Most of the agricultural schools, of which there are 29 scattered throughout the country, require that applicants must have spent some time at a folk high school, and if lacking in practical training, must secure this at one of the government-recognized model farms before they are admitted, these schools teaching primarily the theory of agriculture, land surveying, agricultural chemistry, and the other sciences which underlie the practice of agriculture. There are also so-called "Husmandsskoler," organized particularly for the small farmer, which combine the most valuable features of the folk high schools with those of the agricultural schools and make a strong point of short courses. Such subjects as bee culture, chicken raising, rabbit breeding, etc., receive much attention.

Students wishing to become government experts in agricultural subjects may spend one or more years in study and research at the Royal Veterinary and Agricultural Institute at Copenhagen. Strong schools of household economics are maintained for the women. "The most important task performed by educationists in Denmark has been to impart a remarkably large store of culture without giving the people a contempt for work with the hands."

Schools for fruit growing, H. W. HARRIS (*U. S. Bur. Ed. Bul., No. 54 (1913), pp. 66–75*).—An account is given, by the consul general at Frankfort-on-the-Main, of the administration, buildings and equipment, curriculum, etc., of the Grand Ducal School for Fruit Growing at Oppenheim-am-Rhein, and of the Provincial School for Fruit Growing at Kreuznach.

Nature study, I. L. KANDEL (In *Elementary Education in England With Special Reference to London, Liverpool, and Manchester. U. S. Bur. Ed. Bul., No. 57 (1913), pp. 56–59*).—An account is given of the nature study work in elementary schools of England, which includes the study of plants, trees, flowers, and animal life.

Continuation schools; Short courses for colleges, normals, and high schools, A. W. NOLAN (*Agr. Col. Ext. Univ. Ill. [Circ.], 1914, Jan., pp. 16, figs. 2*).—The courses in agriculture, English, hygiene and good health, history and civics, business arithmetic, and household science outlined in this circular have been successfully given in a few schools. For a beginning a maximum length of six weeks is advised for these courses, which are intended for young men and women and adults of the community who have no prospects for a complete high school course.

A manual of agriculture for the eighth grade, A. M. RICHARDSON (*Wash. (State) Dept. Ed. Bul. 21 (1914), pp. 27*).—This manual is intended to form the basis for the examination in agriculture for the eighth grade in the schools of the State of Washington, in which agriculture is required by the state board of education. Forty-nine exercises are outlined including practically every phase of agriculture. It is stated that if possible they should be studied according to seasons.

Studies of commercial fertilizers, B. M. DAVIS (*Nature-Study Rev., 10 (1914), No. 4, pp. 122–129*).—Two exercises which should be within the capacity of the seventh and eighth grade pupils are presented, viz., (1) estimating the value of a commercial fertilizer, and (2) calculating the amounts of fertilizer ingredients in the home mixing of fertilizers and in estimating comparative values of fertilizers.

Weed collections for schools, F. J. PIPAL (*Purdue Univ. Dept. Agr. Ext. Bul. 27 (1913), pp. 12, figs. 8*).—Directions for collecting, preserving, and mounting weeds, and suggestions to teachers of studies of weeds that may be made in connection with this work are given, as well as a list of the worst Indiana weeds.

List of workers in subjects pertaining to agriculture and home economics in the U. S. Department of Agriculture and in the state agricultural colleges and experiment stations (*U. S. Dept. Agr., List of Workers in U. S. Agr., 1914, pp. 90*).—This is an organization list of workers along these lines, and includes in the case of this Department brief statements as to organization and scope of its various branches.

NOTES.

Delaware Station.—Dr. J. J. Taubenhaus has been made associate research plant pathologist.

Purdue University.—Oscar G. Anderson has been appointed instructor in pomology in the school of agriculture.

Maryland College and Station.—The faculty has voted to grant annually a restricted number of certificates of merit (usually three) to men who have achieved distinction in some field of agricultural activity, and in this way tended to advance the economic, social, or moral conditions of rural life. For the present these honors are to be confined to citizens of the State, but ultimately it is planned to remove this limitation.

C. E. Temple, botanist at the Idaho University and Station, has been appointed associate pathologist in the state horticultural work.

Massachusetts College.—The addition to French Hall has been completed and is being occupied by the departments of forestry and market gardening.

Recent appointments include H. E. Baldinger as assistant in dairying, Loyal F. Payne, poultryman of the Oklahoma College and Station, as instructor in poultry husbandry, Benjamin W. Ellis as extension instructor in farm management, and Miss Harriet J. Hopkins as extension instructor in home economics. Promotions include E. L. Quaife as assistant professor of animal husbandry, A. H. Nehrling as associate professor of floriculture, F. H. Van Suchtelen as asssociate professor of microbiology, B. N. Gates as associate professor of bee keeping, E. Anderson as associate professor of chemistry, and R. H. Bogue as instructor in chemistry. A. A. Brown, instructor in poultry husbandry and Ivan McKellip, instructor in dairying, have resigned.

Michigan College and Station.—H. T. Darlington of the Washington College has been appointed assistant professor of botany and will have special charge of the botanical garden and herbarium. E. F. Woodcock of the botanical department of West Virginia University has been appointed instructor in botany, vice Dr. Ruth F. Allen, resigned to accept a similar position in Wellesley College. S. P. Doolittle, a 1914 graduate of the college, has been appointed to an industrial fellowship in cucumber diseases recently established by the H. J. Heinz Pickle Company.

New Hampshire College and Station.—Ford S. Prince, instructor in soils in the Michigan College, has been appointed instructor in agronomy in the college and assistant agronomist in the station.

Texas College.—Press reports announce the appointment as president of Dr. W. B. Bizzell, since 1910 president of the college of industrial arts at Denton, Texas.

Wisconsin University.—J. F. Wojta has been appointed superintendent of agricultural extension courses and Fred H. Scribner field agent in animal husbandry.

EXPERIMENT STATION RECORD.

Editor: E. W. ALLEN, PH., D., *Assistant Director.*
Assistant Editor: H. L. KNIGHT.

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EXPERIMENT STATION RECORD.

VOL. XXXI. NOVEMBER, 1914. No. 7.

The *Journal of Agricultural Research*, inaugurated by this Department something over a year ago, was opened to contributions from the agricultural experiment stations beginning with its third volume, October, 1914. This action was taken in response to a suggestion from the executive committee of the Association of American Agricultural Colleges and Experiment Stations, in conference with the Secretary of Agriculture. The latter readily agreed to extending the pages of the *Journal* to the experiment stations for the publication of their technical research papers, and a committee of three was appointed by the association to act with the Department representatives as an editorial board. A meeting of the joint committee was held in Washington last June, and procedure agreed upon. As a result, a circular letter announcing the completion of arrangements was addressed to the various institutions and their workers. The way is therefore open for enlarging the scope of the *Journal* as a record of agricultural research in the United States, and for prompt and adequate presentation of the stations' contributions to it.

The Department and the experiment stations constitute, of course, the two great agencies for agricultural research in this country. Until recently, however, the product of their activities in this line has been so widely scattered through many independent series of bulletins, and so enveloped in more popular writings, that it has lost both in immediate effect and in permanence. It has been difficult for librarians and more so for investigators to hunt out these contributions and preserve them in form accessible for reference. Many of the station mailing lists are not classified, their publications are not sent regularly to persons outside the State, and the bulletins can not be subscribed for or purchased through the general publication agencies. Under the old system, the Department's bulletins reporting research must be selected and ordered separately, and were often soon exhausted. These things have had the effect of making these contributions to agricultural science less accessible than they should be. With the classification of the publications of the Department an effective means was provided for segregating accounts of the more technical investigations, and placing them where they might be made permanently available to scientific readers.

The establishment of such a journal is regarded as a distinct step in advance. There has always been confusion in the public mind from indiscriminate mixing of popular and technical work in the bulletins. The practice has had the effect of detracting from a just appreciation of these publications by both the farmer and the man of science, in about equal degree. The former and the public in general have felt that unless the matter in the bulletins could be fully understood, the work was impractical and the reading unprofitable. Men of science, on the other hand, while they have recognized these publications as containing much of interest to science, have complained of the material being enveloped in so much that was of no interest to them, and of the scattered and fugitive form in which it was issued. Hence a classification of the published matter is to the distinct advantage of all classes of readers, makes the popular or practical and the research publications more effective, and prevents misunderstanding and confusion.

The publication of the research work of the experiment stations was a matter of considerable concern when the amount of research began to materially increase under the stimulus of the Adams Act. There were movements for a journal or common organ, growing out of the recognized advantages of such an organ and the large expense of separate publication, but nothing came of these efforts until recently. Meanwhile, the provision of a series of research bulletins by a considerable number of the stations has relieved the situation, but is not felt to have fully solved it. These bulletins result in a segregation which was greatly needed, but they do not overcome the objection to fragmentary publication. The plan has relieved the farmer from the annoyance of getting papers of purely theoretical and technical interest, but it has not fully enabled the scientific world to keep track of what is being done or to find it after a few years.

The same arguments in favor of a central or common agency for the publication of agricultural investigation apply now that prevailed a few years ago, and probably with equal or greater force. For the stations which have made no attempt at its separate publication such an organ is increasingly important, and for those which have established research series, it adds the advantage of wide circulation, preservation, and adequate indexing of their reports of investigation.

Two main objects are sought in publishing the reports of research—reaching a wide audience of persons interested in the work in question, and recording it where it can be permanently found. Promptness is usually a desirable factor, and the author is naturally

anxious to give as wide publicity as practicable to his contribution. Permanency is a matter of large importance, and this of course is difficult to secure in separate unbound pamphlets.

The people to whom such literature especially appeals are naturally interested in having the material made conveniently accessible to them, and in such form that it not only can be preserved but will be indexed. Hence the index is an important feature of all journal literature, and gives it a material advantage over loose pamphlets or bulletins. Agricultural bibliographies are as yet only sparingly provided. Much search is therefore necessary for the investigator to bring together the literature on a given subject, as it is scattered through such an unusually diverse collection of journals, reports, bulletins, etc. Papers in an indexed journal are much less likely to be overlooked in a review of literature, and are more conveniently cited.

The wide distribution which the *Journal of Agricultural Research* has already reached among institutions and libraries, agricultural and otherwise, and its extensive foreign list established through exchanges, insures unusually wide publicity of articles published in its pages. Already the *Journal* is accessible to a very large share of the world's workers in natural science whose studies bear on the broad field of agriculture, and its circulation will steadily increase with time. This will mean much to its contributors in securing recognition among scientific men.

Furthermore, such an organ offers the opportunity for publishing preliminary and minor papers not suited to a bulletin. This obviates the necessity of withholding publication until the work has been fully concluded, or of publishing in an organ devoted to general science. The liberal provision of separates enables special distribution to be made by the institution or the author.

Aside from these considerations, the effect of collective publication in giving an adequate idea of the extent of American investigation in agriculture, and securing for it the recognition it deserves, is perhaps well worth taking into account. The mass of research material turned out by these agencies, which were long thought of as engaged largely in working out practical farm problems by simple trials and experiments, would make an impression on the scientific world if brought together that the scattered method of publication can not secure. The first year of the *Journal* has served to establish its character and give it standing as a research publication, so that henceforth it may be regarded as a dignified and desirable place for high-grade contributions.

Agricultural investigation has waited many years for the provision of an organ where its work could be brought together and published without prejudice or misunderstanding. The new journal has com-

mended itself to the scientific world and has found a place. It is matter for congratulation that the Department and the stations are now to join in its maintenance, and it is believed that the opportunity which it offers will be recognized and welcomed by many experiment station workers.

The establishment of a section for agriculture in the American Association for the Advancement of Science places this subject on a footing with the other great branches of science, pure and applied, in the foremost scientific asssociation of the country. At the same time it serves to round out the purview of the association, making it more fully representative of all science. It thus recognizes the subject of agriculture in a manner which will be gratifying to those associated with its study, and it expresses its broad relations to science as hardly any other action could.

In this step the American Association followed the lead of its sister organization, the British Association, which some ten years ago provided a subsection for agriculture; and it also carries out the plan of the corresponding association for natural science and medicine in Germany, which for some years has provided for agriculture in its program.

It is noteworthy that the movement for a section representing agriculture did not emanate from those directly associated with the subject, but came primarily from without the agricultural colleges and the various agricultural societies. It was felt by the council to be a logical expansion of the association, to round out its scope, and to give recognition in its organization to the place agriculture has assumed in science and as an industry developing through science. The broadening interest in it among men of science is one of the notable changes which have come about in its recent development. For many years the various sections of the American Association have given much attention to special aspects of agricultural investigation and economics, and the Society for the Promotion of Agricultural Science has been listed among its affiliated societies. But heretofore the subject has had no definite place in the organization of the association or on the program of its meetings. It had come to be "conspicuous by its absence."

The number of special agricultural societies is now sufficient to provide for the communication of technical papers dealing with the progress of investigation in almost any branch of agriculture, and the largest of these, the Association of American Agricultural Colleges and Experiment Stations, deals with the questions of policy and administration respecting the institutions represented in it. But the new section will afford an opportunity not otherwise provided for the discussion of agricultural topics of a more general

nature, on an occasion which will naturally bring together a large body of men to consider scientific, social, and economic questions. Hence, without interfering with any other agency, it should tend to promote the broadest interest and understanding in this many phased subject. And what is more, it is hoped that it may serve to bring the men of agricultural science into more close association with the men of general science, who although working in distinct fields yet have much in common. For there is a danger in too narrow specialization, and especially in too narrow association.

Many now go to the association meetings for their more intimate touch with science and fellowship with its followers, and to the gatherings of agricultural specialists for their contact with agricultural investigation and the men engaged in it. The separation of these meetings in time and place involves an added expense and often results in less frequent attendance upon them. The new section may possibly serve in time as a nucleus around which the meetings of specialists may be gathered, furnishing the double opportunity for discussion of specialized subjects in agronomy, animal nutrition, and the like, and for the broader affiliations in science at one and the same occasion. If so, one of the important objects of the federation of agricultural societies attempted without success a few years ago would be accomplished, and the interest and affiliations of men engaged in agricultural work would be less widely removed.

It will not be the policy of the new section to encroach upon the field of any of the special societies in the presentation of papers and reports, but rather to afford a place where some of the large subjects relating to agriculture, its organization, its investigation, its teaching, or its general upbuilding on the basis of modern science, may be discussed in an academic way. The initial meeting of the section will be held at the annual convocation in Philadelphia during the holidays. A feature of the program will be a symposium on the subject of The Field of Rural Economics, to be discussed by several speakers invited to present their views on different phases. The symposium will be opened by the Assistant Secretary of Agriculture, Hon. Carl Vrooman, who will deal with Rural Economics from the Standpoint of the Farmer. Others will consider the marketing of agricultural products, rural organization, rural credit, and related topics in relation to the industry and the people living under it. So many of the live questions in agricultural advancement to-day center in its economic relations that the subject opens up a broad and profitable field. The vice-presidential address will be upon The Place of Research and of Publicity in the Forthcoming Country Life Development.

The vice president for the new section is Dr. L. H. Bailey of New York, who will preside at its first meeting. The section is repre-

sented on the council of the association by Dr. W. A. Taylor of this Department, and on the general committee by Dean E. Davenport of Illinois. The members of the sectional committee are Dr. E. H. Jenkins of Connecticut, Prof. H. A. Morgan of Tennessee, Dr. W. H. Jordan of New York, Dr. C. W. Dabney of Ohio, and Dr. H. P. Armsby of Pennsylvania. These names attest the highly representative character of the section at the outset, and command for it the interest of all those who are allied with the material and intellectual promotion of agriculture, its organization and scholarly advancement.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

The chemical constitution of the proteins. R. H. A. PLIMMER (*London, New York, Bombay, and Calcutta, 1913, 2. ed., pt. 2, pp. XII+107*).—In the second edition of this book (E. S. R., 21, p. 210) the subject matter has been somewhat rearranged to give a more complete idea of the problem of the synthesis of the proteins.

On the occurrence of dextrorotatory albumins in organic nature, J. BEARD (*Biol. Centbl., 33 (1913), No. 3, pp. 150–170*).—In this work the author seeks to show that dextrorotatory albumins occur and are widely distributed in organic nature. To prove this hypothesis the Fischer "lock and key" procedure was utilized. The enzyms employed were a mixture of trypsin and amylopsin (Fairchild) diluted with clear fresh rain water. The organisms submitted to the action of the enzyms were a Verticella *Planaria lactea*, *Hydra fusca* alone or in water containing either *Trichodina pediculus* or *Daphnia pulex;* Amœba alone or with crustacean "*nauplii;*" *Nais proboscidea* with either *Melicerta ringens* or *Carchesium polypinum: Cordylophora lacustris, Carchesium polypinum*, and a hydrachnid; *Actinosphærium eichhorni;* and *Stentor cœruleus.* Various flagellate monads and micro-organisms(?) were also studied.

"The 17 experiments carried out have established the thesis that living asexual generations of animals are attacked, killed, and their albumins pulled down by solutions of the pancreatic ferments, trypsin, and amylopsin (Fairchild), in which sexual generations of animals go on living. The following asexual generations of animals exhibited the deadly pulling-down action of pancreatic ferments, and thus revealed the dextrorotatory nature of their albumins: Hydra, Cordylophora, Trichodina, Vorticella, Carchesium, Amœba, Actinosphærium, and Stentor, eight in all. . . . The following sexual generations of animals continued to live in solutions of these ferments . . . : Daphnia, a hydrachnid or water mite, crustacean *nauplii*, Planaria, Nais, and Melicerta, six in all. Zoologically, the experiment with *H. fusca* and *D. puplex* has special interest, as *D. pulex* is a common prey of Hydra."

The value of enzyms for the treatment of tuberculosis, the chief tropical diseases, and other infectious diseases caused by unicellular organisms is discussed. Enzyms when introduced into the diseased body serve as an auxiliary in the defensive mechanism and also help to digest the food of the individual.

Some experiments on the precipitation of suspensoid protein by various ions and some suggestions as to its cause, W. N. HEARD (*Jour. Physiol., 45 (1912), No. 1–2, pp. 27–38, figs. 2*).—"The power of an electrolyte to precipitate negatively charged suspensoid protein, while primarily dependent upon the valency of the cation, is greatly modified by the relation of the latter to the OH group, and its capacity to reduce the ionization of that group. The reason the order of precipitation somewhat resembles the order of hydrolysis is due to the fact that in both cases the reaction is between the cation and the OH

group; but the law of the ions and the complicated conditions present in the mixture of protein and electrolyte cause considerable differences between the two orders which are only superficially alike. Hydrolysis may or may not increase the precipitating power of an electrolyte according to the power of the cation and its relation to H. The trivalent and most powerful divalent metals have two curves of precipitation, and it is suggested that the first is the throwing down by the anion of the protein which has been made electropositive by the cation.

"Positively charged suspensoid protein being kept in solution by the charge given it by H, the power of the anion to precipitate is due to its capacity to reduce the ionization of the compound of acid and protein. Though the cation is the principal element in the precipitation of alkaline protein, and the anion in the precipitation of acid protein, the accompanying ion is probably never without some effect. Probably this influence is of a complex nature and due to different causes."

Nitrogenous hydrolysis products of several phosphatids. C. G. MacArthur and G. Norbury (*Abs. in Science, n. ser., 38 (1913), No. 984, p. 678*).—The phosphatids studied were sheep brain cephalin, sheep brain lecithin, ox heart cuorin, and ox heart lecithin. Each of the preparations was purified and hydrolyzed with dilute hydrochloric acid In every case the fatty acid residue contained nitrogen and usually it represented one-sixth of the total substances.

Fatty acids from cephalin. L. V. Burton and C. G. MacArthur (*Abs. in Science, n. ser., 38 (1913), No. 984, p. 678*).—The fatty acids obtained as a result of hydrolyzing purified cephalin with a dilute hydrochloric acid solution were separated into the saturated and unsaturated fatty acids by the lead acetate method. The acids were identified.

Researches on the nature of enzym action.—III. The synthetic action of enzyms. W. M. Bayliss (*Jour. Physiol., 46 (1913), No. 3, pp. 236–266, figs. 3*).—This continues previous work (E. S. R., 27, p. 612).

"Reactions in the system, glycerol, glucose, glycerol-glucosid, and water, as accelerated by emulsin, follow in all respects the laws deduced from mass action for an equilibrium in a reversible system, catalyzed by a single enzym. The equilibrium position is the same from whichever end it is approached. The glucosid produced is the β form and the same which is hydrolyzed by emulsin. The rate of the reaction is directly proportional to the concentration of the enzym, although not in linear proportion. The final equilibrium attained is independent of the concentration of the enzym.

"Results in which it appeared that a large amount of enzym was capable of producing a different equilibrium position from that produced by a smaller amount are shown to have been due to removal of the enzym, either by destruction or paralysis by products, before true equilibrium was attained. Van't Hoff's view as to the greater ease of synthesis of the glucosids of the primary alcohols, as compared with those of the tertiary alcohols, is confirmed in the case of the two kinds of amyl alcohol. Evidence is given to show that the action of emulsin, which takes place in liquids in which it is completely insoluble, is exerted on its surface. The reacting substances are probably brought into close contact by condensation on this surface (adsorption), owing to their causing diminution of surface energy.

"Rosenthaler's hydrolyzing form of emulsin is shown to be capable of synthetic action in addition; while his experiments supposed to show the separate existence of an emulsin with synthetic powers only could not be confirmed. Both powers were found to disappear together, so that the equilibrium point under enzym preparations, treated and untreated, was the same, although the rate of the reaction was different. The results of dilatometer experiments are

shown to be very difficult of interpretation, and although they show that the glucosids of tertiary alcohols are much more difficult to synthesize than those of primary alcohols, no conclusion can be drawn as to complete absence of reversibility in the former case. The glucosid formed by the action of acid was found to be a mixture of α and β forms in the ratio of 75.3 parts of the former to 24.7 parts of the latter. The $[\alpha]_D$ of the former is 91.2° and that of the latter —38°. As regards emulsin and maltase in their behavior toward glucosids, the same optical isomer is hydrolyzed and synthesized. Robertson's 'synthesis of paranuclein by pepsin' is not a synthesis, nor is it produced by pepsin, while the substance formed is not paranuclein. It is, in fact, a colloidal precipitation and has no connection with enzym action.

"From the results given in this paper some general conclusions may be drawn. Since we find that, in a simple system, easily investigated, the action of an enzym, emulsin, is found to follow without exception the laws of catalysis by a single agent, the conclusion seems justified that, whenever we meet with apparent deviations from such laws, instead of inventing new enzyms or making assertions as to the nonapplication of the laws of physical chemistry to enzym action, we should endeavor to find the reasons for the divergence. Until the impossibility of finding such reasons has been demonstrated, it is more in accordance with scientific method to hold provisionally the application to all enzyms of the laws which we can show to apply to so many. I think that we ought, in the interest of clear conceptions, to go even farther and to deny the application of the name 'enzym' or 'ferment' to any substance not manifesting the properties of a catalyst."

The mutual action of pepsin and trypsin. J. H. Long (*Abs. in Science, n. ser., 38 (1913), No. 984, p. 674*).—Making due allowance for the reaction of the medium, the experiments show that within the practical limits of body behavior trypsin has no important action on pepsin. Pepsin, on the other hand, is markedly destructive to trypsin, and an acid medium weakens trypsin. Pepsin and acid present with trypsin in the same medium destroy the latter rapidly.

Experiments on the separation of the starch-liquefying from the starch-saccharifying power, and the demonstration of starch-dextrinizing and starch-precipitating powers of amylase of cereals. T. Chrzaszcz and K. Terlikowski (*Wchnschr. Brau., 29 (1912), Nos. 41, pp. 590–593; 42, pp. 607–610; 43, pp. 623–626; 44, pp. 636–639, fig. 1; abs. in Jour. Soc. Chem. Indus., 31 (1912), No. 22, pp. 1089, 1090*).—This is a study of the amylases of barley, oats, millet, corn, wheat, and rye. The amylases were precipitated from cold water extracts of the cereals with a 35 to 40 per cent solution of ammonium sulphate. The resulting precipitates were dissolved in water and reprecipitated fractionally by treating the solution with successive quantities of ammonium sulphate, i. e., from 5 to 35 per cent.

"The ratio of liquefying power to saccharifying power varied widely in different fractions. In some cases the later fractions, possessing considerable saccharifying power, appeared to exert no liquefying action whatever. With barley, rye, and wheat the functions of maximum liquefying power possessed also the maximum saccharifying power, but this was not so with maize and millet, and even in the former cases the increase or decrease of the two powers in successive fractions did not proceed pari passu. The measurement of the liquefying power was in some cases rendered difficult by coagulation of the starch, effected by an enzym (amylo-coagulase) present in different amounts in the various grains and in greatest quantity in rye. The action of this enzym was observed also in carrying out the saccharification tests, for it gave rise to turbidity when the amylase was added to the starch solution.

"There was found to be no close correspondence between the saccharifying power of the different fractions and the iodin reaction of the saccharified starch solutions obtained in determining this power. The authors conclude that the quantitative value of the liquefying power of the amylases of grains is independent of their saccharifying power, that their starch-dextrinizing power is to some extent independent of both of the former, and that they possess also in varying degrees a starch-precipitating power due to amylo-coagulase."

For previous work see an earlier note (E. S. R., 23, p. 410).

The enzyms of Linaceæ, J. V. EYRE (*Chem. News, 106 (1912), No. 2758, pp. 167, 168; abs. in Chem. Ztg., 37 (1913), No. 28, p. 281*).—The results show that quite a number of enzyms may be present in the leaves and seeds of this plant and that the amount varies considerably. Linase acts less strongly upon linamarin than upon prunassin. During growth enzym activities toward linamarin become less and an increase in hydrolysis of prunassin and amygdalin is noted. The enzymatic activity seems to stand in close relation with the presence of cyanogenetic glucosids. The varieties of plants having blue, white, or red flowers contain cyanogen while those of a yellow color have neither an enzym nor a glucosid.

The gasometric determination of aliphatic amino nitrogen in minute quantities, D. D. VAN SLYKE (*Jour. Biol. Chem., 16 (1913), No. 1, pp. 121–124*).—The apparatus previously described (E. S. R., 29, p. 108) has been reduced in size so that it may be used for small quantities of material, which brings the procedure into the class of micromethods. With the microapparatus the error need not be more than 0.005 mg. of nitrogen when 2 cc. or less of gas is measured, or 0.01 mg. when more is obtained.

Improved methods in the gasometric determination of free and conjugated amino-acid nitrogen in the urine, D. D. VAN SLYKE (*Jour. Biol. Chem., 16 (1913), No. 1, pp. 125–134*).—"The previously published process of determining the total amino-acid nitrogen (free amino acids + conjugated amino acids in the form of hippuric acid, peptids, proteins, etc.)[a] has been simplified so that the operation is much shortened and the more laborious parts, boiling off ammonia and washing bulky precipitates, are dispensed with. The free amino acids alone can readily be determined after decomposition of the urea with soy-bean urease, which hydrolyzes urea completely without either freeing conjugated amino acids or deaminizing free ones. The applicability of the gasometric method for the determination of hippuric acid is indicated."

See also other notes (E. S. R., 25, p. 710; 26, p. 22).

A method for the determination of small amounts of fat (preliminary report), W. R. BLOOR (*Abs. in Science, n. ser., 38 (1913), No. 984, p. 678*).—The method consists of extracting the fat from tissues or liquids with an excess of alcohol-ether (25 per cent of ether), putting an aliquot of the filtered extract into distilled water, and determining the amount of fat by comparing it with a cloudy suspension of known fat content in a nephelometer. The method has given good results with blood and milk.

The analysis of maple products.—I, An electrical conductivity test for purity of maple sirup, J. F. SNELL (*Jour. Indus. and Engin. Chem., 5 (1913), No. 9, pp. 740–747, figs. 2*).—The method (E. S. R., 27, p. 207) is designed for the detection of additions of sucrose to maple sirup. Inasmuch as sucrose is a nonconductor of electricity and salt constituents conductors, a maple sirup adulterated with sucrose will show a lower conductivity. The method is of special value because the conductivity determination can be made in a few minutes.

[a] Jour. Biol. Chem., 12 (1912), No. 2, pp. 301–312.

The mean densities and conductivities of 42 genuine maple sirups were found to be 1.333 at 15° C. and 18.7 ($K \times 10^5$) at 25°, the minimum 1.305 and 9.6, and the maximum 1.355 and 33.6, respectively. A sirup not included in the 42 samples showed a specific gravity of 1.279, a conductivity ($K \times 10^5$) of 45, and a moisture content of 38.59 per cent. As a general rule, sirups of high density show low conductivities and sirups of low density high conductivities, indicating that in undiluted sirups the concentration of the sugar has more influence upon the conductivity than has the concentration of the electrolyte components. The measurements show that the more dilute the sirup the greater the conductivity. When sirup is diluted with water to contain only 33⅓ per cent of actual sirup by volume, a point of maximum conductivity is reached. If the dilution is continued beyond this point the conductivity begins to decrease.

As on either point of maximum conductivity there is a considerable range of concentration without which the conductivity differs very little, it is possible to measure the maximum conductivity of a maple sirup without observing much precaution in making up the sirup-water mixture. "The mean conductivity at 25° ($K \times 10^5$) of the diluted solutions of the 42 sirups [mentioned above] was 153, or over eight times the mean conductivity of the same sirups in the undiluted state. The minimum was 120, the maximum 203, the latter being the conductivity value of the sirup made in the iron kettle. . . . Genuine sirups have given values of 110 to 200, but further experience may extend these limits a little. Sirups giving conductivity values distinctly outside these limits may be condemned. Those giving normal values are not necessarily pure and should be further examined by well-established tests."

In addition to the 43 sirups mentioned above, 22 taken from the trees of Macdonald College grounds and prepared in the laboratory were examined. These showed a range from 119 to 164, with an average of 143. Three Vermont sirups gave conductivity values of 110, 115, and 122. The minimum value found in the work was 110 and the maximum 203. The highest value for a sirup actually prepared for the market was 197. By weighting the 22 sirups made from the trees on the Macdonald College farm as 2, a mean conductivity value is obtained of 150. This is approximately equal to the electrical conductivity of an 0.01 molar aqueous solution of potassium chlorid (141.2)."

No conclusions were drawn from the results obtained as to the value of determining the conductivity of the ash solution.

The analysis of maple products.—II, A comparative study of the delicacy of methods, J. F. SNELL and J. M. SCOTT (*Jour. Indus. and Engin. Chem., 5 (1913), No. 12, pp. 993–997*).—In studying the value of the electrical conductivity test for detecting adulterations in maple sirup it appeared desirable to compare the delicacy of this test with that of other methods in vogue. Three sirups were chosen for the experiment—one a light-colored sirup, another a mixture of several pure sirups, and the third a sirup prepared at the Macdonald College.

The determinations made were insoluble ash and alkalinity of insoluble and soluble ash (E. S. R., 17, p. 1038; 24, p. 266; 26, p. 661); soluble ash by difference; conductivity value, by the method outlined in the preceding abstract; Canadian lead number; Winton lead number (E. S. R., 18, p. 420); Ross's modified Winton number (E. S. R., 22, p. 709); and Sy lead value (E. S. R., 20, p. 1106).

In the work the rates at which the conductivity value, ash data, and the various lead values fall off when maple sirup is diluted were noted. The Canadian lead value showed the most rapid falling off, while the conductivity value showed the narrowest range. The duplicates obtained by the Winton

lead method were in closer agreement than those of the Canadian method. In the latter method practically no difference was noted when the precipitates were washed at 80 and 100°. Almost identical results are obtained when 100 to 150 cc. of wash water was used, but higher results were noted when only 50 cc. was employed.

"Results obtained in the Canadian method, using the quantity of sirup containing 5 gm. of dry matter, are higher than those obtained with the use of 5 gm. of sirup and calculated to the dry basis. On the other hand, in the modified Winton method, prescribed in the Canadian standards, lower results are obtained with the use of the quantity of sirup containing 25 gm. of dry matter than when 25 gm. of sirup is used and the results calculated to the dry basis. The use of cane-sugar sirup instead of acetic acid in the Winton blank is suggested."

Spica's method for determining the citric acid in citrates and lemon juice, F. Scurti and G. Tommasi (*Ann. R. Staz. Chim. Agr. Sper. Roma, 2. ser., 6 (1913), No. 1, pp. 61–65; abs. in Chem. Ztg., 36 (1912), No. 139, p. 1362*).—The method, according to its originator, can always be used providing tartrates and oxalates are absent. It has, however, been found in this investigation that other substances such as grape sugar, levulose, arabinose, lactose, starch, inulin, cellulose, wood, gum, lactic acid, egg albumin, etc., when treated in the manner described by Spica will also yield carbon dioxid; consequently the method is unusable for most purposes.

An investigation to determine the accuracy of a modified Meigs method for the quantitative determination of fat in milk, with a description of an improved form of apparatus, W. L. Croll (*Biochem. Bul., 2 (1913), No. 8, pp. 509–518, pl. 1*).—Although the Adams paper-coil method with a Soxhlet extracting apparatus is considered the most accurate procedure for determining the fat in milk, it requires much time and care for its execution. The original Meigs method (1882) is neither extremely rapid nor simple, but it possesses certain advantages that make its use preferable for biochemical and pediatric investigations.

As the results obtained by the method compared favorably with those given by the Soxhlet method, an investigation was made to determine whether this was a mere coincidence or due to the efficiency of the method. "For this purpose there were secured 12 samples of human milk from women in various stages of lactation, and six of cow's milk from as many dairies, so widely separated that in no two cases were the milks from the same herd. In all determinations the milk for both the Meigs and the Soxhlet methods was taken from one specimen and at the same time, so that the samples were as nearly uniform as it was possible to get them. In every weighing the figures were recorded to 0.01 mg. The average difference in the results of the 18 determinations recorded in the table is 0.0234 per cent."

In the manipulations it was found that the use of the pipette was exceedingly tedious and required a great deal of skill and practice, and that the probability of error was great. An inexpensive piece of apparatus was therefore devised which renders the use of a pipette unnecessary and obviates the need of care in regard to the protein layer. "The improved Meigs method possesses the following advantages over the Soxhlet: (1) The time in weighing out is shortened and the danger of accidental loss is diminished, for no absorption of the milk by fat-free material is necessary; (2) two or three hours are saved as no drying is required; (3) the extraction requires ten minutes for its execution against three hours as the minimum for the Soxhlet process."

A new apparatus for determining the water content of cheese (*Milchw. Zentbl., 42 (1913), No. 4, pp. 107, 108, figs. 1*).—The apparatus consists of a distilling flask held in a square glycerin bath, and a metal condenser. The Rusche apparatus may also be arranged so that its use is permissible for the determination of moisture with petroleum according to Mai and Rheinberger's method (E. S. R., 28, p. 612).

A new apparatus for determining the water in cheese, MAI (*Milchw. Zentbl., 42 (1913), No. 7, p. 220*).—An objection to some of the statements made in the article abstracted above. It is maintained that all of the specifications set down by Mai and Rheinberger must be strictly adhered to in order to obtain accurate results.

A new apparatus for determining the water in cheese, RUSCHE (*Milchw. Zentbl., 42 (1913), No. 10, pp. 315, 316*).—A polemic as to priority.

Various methods for determining fat in cheese, and a comparative study of the volumetric and gravimetric methods. W. D. KOOPER (*Milchw. Zentbl., 42 (1913), No. 12, pp. 353–368*).—The results obtained with the gravimetric Bondzynski-Ratzlaff method were higher than those given by the volumetric methods of Burstert (E. S. R., 20, p. 112), Hammerschmidt (E. S. R., 30, p. 208), Wendler (E. S. R., 30, p. 208), and Kooper (E. S. R., 30, p. 207). Pure butter fat was apparently not attacked by the solvents used in the Wendler and Kooper methods.

The specific gravity of cheese fat is not the cause of the differences observed between the two methods, as the difference between the specific gravities of the fats is too small. Mixtures of pure cheese fat and the fat residue obtained from one of the gravimetric milk tests and a mixture of cheese fat and cheese gave high results. The high figures obtained by the gravimetric method are said to be due to the fact that the solvents extract decomposition products of cheese fat, i. e., fatty acids, and these are weighed finally as fat. In the volumetric determination the decomposition products do not appear in the fat column to be read off.

The determination of the acidity of cheese (*Milchw. Zentbl., 42 (1913), No. 10, pp. 306, 307, fig. 1*).—A description and illustration of an automatic pipette for determining the acidity in cheese and milk. The cheese is rubbed up with water in a mortar graduated up to the 100 cc. mark, and then made up to 100 cc. with water. The emulsion is titrated with fourth-normal sodium hydroxid solution, using phenolphthalein as the indicator.

Estimation of nicotin in tobacco, N. CONTA (*Rend. Soc. Chim. Ital., 2. ser., 4 (1912), No. 9, pp. 258–260; abs. in Chem. Ztg., 36 (1912), No. 139, p. 1363*).—The nicotin is precipitated by means of a 10 to 20 per cent solution of potassium silicotungstate. The base is liberated from the washed precipitate by means of magnesium oxid and distilled with steam into a solution of sulphuric acid of known strength.

The molds of cigars and their prevention, R. H. TRUE (*U. S. Dept. Agr. Bul. 109 (1914), pp. 8*).—This paper discusses the losses due to the development of molds on cigars, outlines the studies directed toward their prevention, and presents practical directions for the use of an effective remedy.

"The molds were found to be introduced principally through the gum-tragacanth paste used to fasten the small flap at the head of the cigar. The sterilization of the paste by using a nearly saturated solution of boric acid instead of water in mixing it has proved so successful that it has become a routine process in the factory in cooperation with which the investigations were conducted."

METEOROLOGY—WATER.

Meteorological observations in connection with botanical geography, agriculture, and forestry. R. Zon (*Mo. Weather Rev., 42 (1914), No. 4, pp. 217–223, fig. 1*).—This article shows how present meteorological observations on temperature, pressure, precipitation, humidity, and wind movement may be regrouped and classified so as to be more useful in the study of plant growth, indicating at the same time certain other observations, especially on soil temperature and moisture, which may be utilized for the same purpose.

It is stated that in order "properly to understand plant life it is essential to group temperature data by periods of growth and rest." A map is given showing the vegetal regions of the United States based on such periods and deduced from the mean monthly temperature for 685 Weather Bureau stations. It is suggested that temperature data should also be grouped with reference to periods of snow cover and to the direction of the wind.

"The method of computing average temperatures, or the summing up of temperatures for different species of plants separately," is considered of little practical value to the biologist. It is more important to distinguish groups of days with a given range of temperature. A classification based on this idea is outlined. The importance of observations on soil temperature and humidity of the air is recognized, but no classification of such data is attempted.

As regards precipitation, it is suggested that "it will be well to compute the number of days with considerable precipitation in per cent of the total number of days of observation in general, as well as specifically, for winds of different direction. . . . Detailed information concerning the snow cover is especially instructive at the time of its appearance and disappearance. . . . It would be of great advantage to students of plant life if [soil moisture] determinations could be made at agricultural and forest experiment stations. . . .

"Some simple sunshine record, especially for winds of different directions, is also necessary. The occurrence of days with sunshine should be given in per cent of the total number of observations.

"Air pressure has no direct bearing upon plant life, except that its observation often makes it possible to forecast changes of importance to agriculture."

In conclusion the author points out that, "with the exception of the records of soil humidity and soil temperature, the system of meteorological observations outlined can be carried out with the data which are regularly obtained by our weather stations."

Period of safe plant growth in Maryland and Delaware. O. L. Fassig (*Mo. Weather Rev., 42 (1914), No. 3, pp. 152–158, pl. 1, figs. 8; abs. in Bul. Amer. Geogr. Soc., 46 (1914), No. 8, pp. 587–590, fig. 1*).—The frostless period in these States was determined from data obtained from all meteorological stations in the States having a record covering a period of 10 years or more.

Records at fifty stations covering an average period of 20 years "show that the frostless period, based on the observations of a temperature of 32° F., is about 10 days longer than the period based on the occurrence of killing frosts. This relation holds good in general for stations in open, level places, but apparently does not hold for stations in the mountain districts, where the period based on the occurrence of frosts is longer than that determined from a record of freezing temperatures in a shelter 5 ft. above the ground."

Along the shores of the Chesapeake Bay and the Atlantic Ocean the average period of safe plant growth is shown to be about 210 days, but rapidly decreases with increasing distance from the water's edge. On the western side of the Blue Ridge Mountains and in the lower levels of the Cumberland Valley the period is about 160 days, while on the eastern side of the mountains the period

increases to 190 or even 200 days. In the most western and elevated portion of Maryland the period is but little more than 100 days.

See also a previous note (E. S. R., 30, p. 814).

Monthly Weather Review (*Mo. Weather Rev., 42 (1914), Nos. 3, pp. 137–194, pls. 9, figs. 11; 4, pp. 195–256, pls. 8, figs. 10*).—In addition to notes on weather forecasts for March and April, 1914, river and flood observations, lists of additions to the Weather Bureau library and of recent papers on meteorology, notes from the Weather Bureau library, the weather of each month, a condensed climatological summary, and climatological tables and charts, these numbers contain the following articles:

No. 3.—The Eruption of Sakurashima, January, 1914; Solar Radiation Intensities at Mount Weather, Va. (illus.), by H. H. Kimball; Standard Units in Aerology, by T. W. Richards, A. E. Kennelly et al.; The C. G. S. System and Meteorology, by V. Bjerknes; Progress in Meteorological Optics during 1912, by C. Jensen; Period of Safe Plant Growth in Maryland and Delaware (illus.), by O. L. Fassig (see p. 614); The Progress and Present State of Research on the Evaporation of Moisture in the Atmosphere, by A. Weilemann; Report of the Meteorological Station at Berkeley, Cal., for the Year Ending June 30, 1913, by W. G. Reed; Electric Paragrêles, by A. Angot; A New Turbidimeter, by P. V. Wells; The Lowest Temperature Obtainable with Salt and Ice, by R. A. Gortner; The Motion of the Solar Atmosphere; Lightning at Mount Wilson Observatory, by W. P. Hoge; Continuous Pictures of the Weather; Proposed Daily Weather Map for the Southern Hemisphere; Seismic Disturbances in the Philippines, by M. S. Masó and W. D. Smith; and Possibility of Recurrence of the Floods of March, 1913, by J. W. Smith.

No. 4.—Principia Atmospherica; A Study of the Circulation of the Atmosphere (illus.), by W. N. Shaw; Birkeland's Theory of the Zodiacal Light; A Possible Connection Between Magnetic and Meteorologic Phenomena, by K. Birkeland; Radiotransmission and Weather, by A. H. Taylor; Maurer and Dorno on the Progress and Geographical Distribution of the Atmospheric-Optical Disturbance of 1912–13; Meteorological Observations in Connection with Botanical Geography, Agriculture, and Forestry (illus.) by R. Zon (see p. 614); Tasks and Problems for Meteorological Explorations in the Antarctic (illus.), by W. Meinardus; Conversion of Barometric Readings into Standard Units of Pressure, by R. N. Covert; The Beaufort Wind Scale; Ice Patrol Over the North Atlantic Ocean, by E. H. Bowie; A Lake Huron Current, by J. D. Persons; and Proposed Asiatic Extension of the Russian Weather Service, by J. F. Jewell.

Climatological data for the United States by sections (*U. S. Dept. Agr., Weather Bur. Climat. Data, 1 (1914), Nos. 5, pp. 226, pls. 3, figs. 7; 6, pp. 228, pls. 2, figs. 7*).—These numbers contain, respectively, brief summaries and detailed tabular statements of climatological data for each State for May and June, 1914.

Meteorological records, E. F. Ladd (*North Dakota Sta. Rpt. 1913, pp. 13–20*).—Records are given of daily observations at the station on temperature, precipitation, sunshine, and wind during 1913, and monthly summaries for 1910 to 1913, inclusive.

Ohio weather for 1912, J. W. Smith and C. A. Patton (*Ohio Sta. Bul. 259 (1913), pp. 299–403, figs. 86*).—The temperature and precipitation throughout the State during each month is shown in charts. The usual summary tables are given showing temperature and rainfall at Wooster and throughout the State (1888 to 1912).

The mean temperature for the year at Wooster was 47.8° F., for the State 49.6° F. The highest temperature at the station was 93°, September 10; for the State 101°, July 15. The lowest temperature at the station was —24°, Jan-

uary 13; for the State —37°, January 13. The annual rainfall at the station was 46.6 in., for the State 37.82. The number of rainy days at the station was 124, for the State, 112. The prevailing direction of the wind was southwest at the station and in the State at large.

Water resources of Hawaii, 1912, C. H. PIERCE and G. K. LARRISON (*U. S. Geol. Survey, Water-Supply Paper 336 (1914), pp. 392*).—This report describes the geography of the Hawaiian Islands and presents results of measurements of flow of certain streams and ditches in the Territory made during 1912. Tables giving gage heights and daily and monthly discharges at each station are given, also rainfall measurements.

"The yearly rainfall of the Hawaiian Islands is extremely variable, ranging from a few inches at several low-level leeward localities to more than 400 in., usually at elevations above 2,000 ft. and on the windward sides of the islands. Valleys lying on the same sides of the islands and within a few miles of each other may have a variation in mean annual precipitation of several hundred per cent. The rainfall may also vary greatly at different elevations in the same valley."

Quality of the surface waters of Washington, W. VAN WINKLE (*U. S. Geol. Survey, Water-Supply Paper 339 (1914), pp. 195, pls. 2, fig. 1*).—This paper, prepared in cooperation with the state board of health, describes the natural and economic features of Washington, reports investigations of the surface water supplies with particular reference to their value for domestic and industrial use and for irrigation, and discusses denudation and the influence of natural features.

The conclusion states that "the river waters of Washington are low in mineral content and are good for general industrial use or for irrigation. What little suspended matter they carry is coarse and readily removable. The color of some renders it advisable to purify them by coagulation and rapid sand filtration rather than by slow sand filtration.

"The Columbia River enters the State as a secondary saline water, but it receives large additions of alkaline water and finally carries a water of mixed type with a slight tendency toward primary alkalinity.

"The Cascade Mountain region is being eroded and dissolved at the rate of 1 in. in 500 to 900 years, and the rate of denudation near the summits is nearly equal on both sides of the divide. The rate in the lower altitude is greater on the western than on the eastern slope and greater in the Cascade intermountain region than in the Columbia plains. The rate in the basin of the Columbia River is about 1 in. in 1,300 years. . . . As denudation is not uniform throughout the basin, but is most pronounced in the watercourses themselves, the rivers are deepening and widening their canyons and valleys.

"No lakes are known whose waters are economically important as sources of commercial salts. Waters from the coulee lakes of Washington contain a greater proportion of common salt than the lake waters of southeastern Oregon, and are therefore less valuable for recovery of soda."

Colloids in water and sewage purification, M. F. STEIN (*Engin. Rec., 69 (1914), No. 19, pp. 524, 525*).—The author discusses the peculiar properties of colloids and their influence in settling basins, sand filters, and processes of color removal.

SOILS—FERTILIZERS.

The separation of soil particles according to their specific weight and the relations between plants and soil, J. KÖNIG, J. HASENBAUMER, and R. KRÖNIG (*Landw. Jahrb., 46 (1914), No. 2, pp. 165–251*).—Continuing investigations previously noted (E. S. R., 30, p. 123), the authors report experiments on the

mechanical separation of the constituents of seven soils according to their specific weights for the determination of humus, colloids, etc., and several years' cropping experiments with six soils to determine the manner in which individual crops are nourished from the same soil.

In the first experiments bromoform having a specific weight of 2.83 was diluted with benzol until at a specific weight of 2.64 the heaviest parts of the soils sank in the mixture. By further decreasing the specific weight of the liquid mixture to 2.55, 2.49, and 2.36 the soils were separated into five fractions, according to specific weight, the lightest of which was suspended on the liquid having a specific weight of 2.36.

The ease or difficulty with which a soil was separated into its constituents was found to indicate the uniformity of its composition. An abundant separation of the specifically lighter constituents indicated a soil rich in colloids, humus, and available plant food, while the separation of an abundance of specifically heavier constituents indicated a less productive soil, poor in humus and available plant food, although not necessarily with a small absolute plant-food content.

Clay soil contained none of the constituents of specific weight higher than 2.64, and the sand, loamy sand, loam, and limy soils contained only 1 per cent, while the shale soils contained up to 7.3. The greatest percentages of organic matter, colloids, and available plant food were usually found in the fifth and lightest fraction, and there was usually a steady increase from fraction 1 to fraction 5 in this respect. The most silica, iron oxid, and clay were found in the fraction containing the most plant food. It is concluded that the analysis of a soil with fluids of different specific weights indicates the relative quantities of its constituents and the distribution of plant food in them.

In pot experiments in the plant house crops yielded more dry matter per unit area of soil than those grown in the open. The assimilation of plant food, especially phosphoric acid, by crops was much greater in warm, dry summers than in cool, wet summers, but the increase in dry matter was not correspondingly great. Definite relations existed between the quantity of plant food and the quantity of dry matter obtained, the most marked of which was with nitrogen. It is concluded that if 100 gm. of plant dry matter contain less than 1.61 gm. of nitrogen, 0.59 gm. of phosphoric acid, or 1.66 gm. of potash, the soil needs fertilization with the deficient foods, while if the 100 gm. of dry matter contain more than 2 gm. of nitrogen, 1 gm. of phosphoric acid, or 2.14 gm. of potash, no fertilization with these plant foods is necessary.

Considerable variation was found in the quantities of plant foods absorbed by individual crops, especially the legumes. Red clover contained much nitrogen and relatively little phosphoric acid, while serradella contained more phosphoric acid than any other crop. Red clover and potato plants absorbed the most potash, and red clover absorbed the most lime, followed in order by red beets and potatoes. Lime and potash were found in practically the same amounts in plant dry matter. A one-sided fertilization with potash and phosphoric acid in dry weather when the soil was not deficient in either did not increase the quantity of dry matter.

In the six soils, with one exception, definite relations were established between the quantity of dry matter obtained from crops and the following physical and chemical properties of the soils: The absorptive power for ammonia, according to Knop, and for potash and phosphoric acid, according to Fesca, hygroscopicity, according to Mitscherlich (E. S. R., 24, p. 419), the absorptive power for methyl violet, osmotic water absorption, and the electrolytic conductivity.

Steaming for five hours at five atmospheres pressure proved to be the best method for the determination of available potash in soils. The phosphorus in a soil appeared to be less available the greater the content of lime, magnesia, iron oxid, and clay in the soil. It was also affected by weathering and the kind of crop.

No fixed relations were established between the amounts of phosphoric acid, nitrogen, and lime assimilated by plants and the amounts found to be easily soluble by different methods. The electrolytic conductivity, and also steaming for five hours at five atmospheres pressure before and after harvest, served to indicate the decrease of plant food in soils resulting from plant growth.

Distribution of certain constituents in the separates of loam soils, L. A. STEINKOENIG (*Jour. Indus. and Engin. Chem., 6 (1914), No. 7, pp. 576, 577*).—Experiments conducted with a view to finding the distribution of the commoner elements in the finer separates of a series of ten loam soils are reported.

In every separate examined the percentage of silica was greater than that of any other oxid and decreased from the coarser to the finer particles. Zirconia usually followed the same variation. In all but two cases alumina was second in order of abundance, and in most cases iron was third. The percentages of iron oxid, alumina, titanium, potash, and phosphoric acid usually increased with the fineness of the particles. Lime, magnesia, and soda seemed to follow no general rule.

The influence of electrolytes on the coagulation of clay suspensions, G. WIEGNER (*Landw. Vers. Stat., 84 (1914), No. 3–4, pp. 283–299, figs. 5*).—The author in a discussion of the effect of sodium and calcium hydroxids on clay suspensions explains their flocculating effects on electrical grounds. He points out that the hydroxyl ions of the salts are more easily adsorbed on colloidal surfaces than are the calcium or sodium ions, but that each has a certain limited mechanical power for being adsorbed. On being added to a negatively charged clay suspension the negative hydroxyl ion is first adsorbed and the electrical charge, and therefore the stability of the suspension, increased to a certain limit at which the positively charged calcium or sodium is adsorbed, thus neutralizing the negative charge of the suspension and causing precipitation. That the calcium hydroxid causes precipitation at much lower concentrations is attributed to the higher valence of the calcium ion.

The properties of red colored soils, E. BLANCK and J. M. DOBRESCU (*Landw. Vers. Stat., 84 (1914), No. 5–6, pp. 427–445; abs. in Jour. Chem. Soc. [London], 106 (1914), No. 621, 1, pp. 915, 916*).—Chemical studies of a typical red soil and a deep red-colored weathered soil from augite porphyry showed that a difference existed in their composition which was due to the colloidal condition prevailing in the red soil and the absence of colloids in the augite porphyry. Van Bemmelen's method for determining the colloidal content was found to be inadequate, while on account of the structure of the soils the Rodewald-Mitscherlich hygroscopicity method (E. S. R., 15, p. 847) was favored.

See also a previous note (E. S. R., 29, p. 514).

Acid mineral soils, G. DAIKUHARA (*Bul. Imp. Cent. Agr. Expt. Sta. Japan, 2 (1914), No. 1, pp. 1–40, pl. 1*).—Continuing preliminary studies by Kozai (E. S. R., 21, p. 18) the author reports investigations on the nature and origin of acidity in soils, the relation between various salt solutions and soil acidity, the relation of soil acidity to heating and to size of soil particles, methods of detecting and determining soil acidity, and the relation between soil acidity and the lime factor.

The author concludes from the results of these investigations that in mineral soils acidity is due to absorption of aluminum and iron compounds by the soil

colloids, and in humus soils both to this cause and to humus acids. The use of fertilizer salts was found to render the absorbed aluminum and iron compounds soluble and thus injurious to plant growth. Over three-fourths of the soils of Japan and Korea examined were found to be acid and in one-half of these the acidity was due to aluminum and iron compounds absorbed by the soil colloids. The highest percentage of acid soils was found among those derived from Mesozoic formations, followed in descending order by Tertiary, Paleozoic, Diluvial, and Alluvial soils. Soils from so-called acid rocks were more frequently acid than those derived from basic rocks, but the smallest percentage of acid soils was found among those derived from volcanic ashes.

The author tested various methods of detecting and determining soil acidity and discusses their relative merits. He describes and recommends as simple and reliable a potassium nitrite test. For the exact determination of acidity he proposes a method based upon the fact that when acid soils are treated with a neutral salt solution, preferably potassium chlorid, the aluminum and iron compounds absorbed by the soil colloids are set free in such form as to give an acid reaction to the solution, the degree of which can be accurately determined by titration with standard alkali solution.

Acid soils were found to contain as a rule little lime, and their lime factor was generally unfavorable owing to an excess of magnesia.

Soils and subsoils. W. H. Sherzer (*Mich. Geol. and Biol. Survey Pub. 12, Geol. Ser. 9 (1913), pp. 130–149, pl. 1*).—The soils of Wayne County, Mich., are classified as glacial and river clays, sand and gravel, loam, silt, and muck soils.

The glacial clays consist mainly of silt and clay with a considerable quantity of fine sand. The river clays are more limited in extent than the glacial clays, but their average texture is finer and much more uniform. The sand and gravel soils possess relatively little available plant food, but are light and easily tilled and drained. The loam soils are deemed the most valuable in the county from a purely agricultural standpoint and are adapted to the growing of all crops which may be raised on either the clay or sand. The silt soils are closely related to the loam but are more limited in extent. The muck soils are from one-fifth to one-fourth sand and nearly two-thirds organic matter and contain very little clay. They can not be utilized for agricultural purposes until properly drained and their acidity corrected.

The excessive quantities of nitrates in certain Colorado soils. W. P. Headden (*Jour. Indus. and Engin. Chem., 6 (1914), No. 7, pp. 586–590*).—This article summarizes a number of articles previously noted (E. S. R., 28, p. 31; 29, p. 621; 30, p. 818).

The soils of the island of Luzon. A. J. Cox and A. S. Argüelles (*Philippine Jour. Sci., Sect. A, 9 (1914), No. 1, pp. 1–50, pls. 7, figs. 4*).—The authors discuss the significance of the physics, chemistry, and biology of soils in general and give information based on a number of chemical and mechanical analyses concerning the fertility of some of the agricultural sections of Luzon.

The majority of the soils analyzed appear to be fine-grained and slightly acid. The soils of the Batangas district, consisting mostly of loam or clayey loam resulting from the disintegration of water-laid tuff, agglomerate, etc., are said to be very fertile. The area around Batangas is made up of alluvial and littoral deposits. The Pangasinan soils vary in texture from heavy tenacious clay loam to fine silt and sand or gravel. In certain wooded districts of the Mountain Province the soils are deficient in potash, and in spite of the general fertility of the soil there is a rice shortage in time of drought. The soils of the Cagayan Valley, the composition of which is continually changing owing

to occasional inundations, are generally considered exceedingly fertile and are used for the cultivation of corn, tobacco, etc. The soils of Laguna and Tayabas Provinces are said to be especially suited to the production of coconuts.

Miscellaneous chemical and mechanical analyses of soils from other provinces are given.

Analyses of soil samples from German Southwest Africa, C. GRIMME (*Arb. Deut. Landw. Gesell., No. 262 (1914), pp. 84–101*).—Chemical and mechanical analyses of samples of soils from five localities are reported and discussed. The prevailing soils appear to be sands and loamy sands. Loess, loams, loamy clays, loam marls, and sandy loams are among the remaining soils.

The soils analyzed were most generally deficient in nitrogen and phosphoric acid, with an occasional deficiency in lime and potash also.

Nyasaland soils (*Bul. Imp. Inst. [So. Kensington], 12 (1914), No. 2, pp. 179–208*).—Chemical and mechanical analyses of a number of samples of cotton and tobacco soils from this region are reported and discussed in continuation of previous work of the same kind.

Moor culture, E. SIERIG (*Die Moorkultur. Berlin, 1913, pp. VII+126, figs. 11*).—This publication deals with the subject of moor culture largely from an economic and sociological standpoint, although the strictly agricultural phase of the subject is briefly discussed.

The soil solution and the mineral constituents of the soil, A. D. HALL, WINIFRED E. BRENCHLEY, and LILIAN M. UNDERWOOD (*Jour. Agr. Sci. [England], 6 (1914), No. 3, pp. 278–301, pls. 5*).—This is a reprint of an article already noted from another source (E. S. R., 30, p. 124).

How does the plant obtain its nutriment from the soil? A. D. HALL (*Mem. and Proc. Manchester Lit. and Phil. Soc., 58 (1913–14), pt. 2, Art. 6, pp. 22, pls. 6*).—This article is based upon the results of the same experiments reported in full in the article noted above.

Harmful effects of aldehydes in soils, O. SCHREINER and J. J. SKINNER (*U. S. Dept. Agr. Bul. 108 (1914), pp. 26, pls. 8*).—Salicylic aldehyde, found to occur in considerable amounts in certain field and garden soils from various localities, was used at rates of from 10 to 200 parts per million of medium in water cultures with wheat, corn, rice, cowpeas, and cabbage; in pot experiments with wheat, corn, and clover; and in field experiments with cowpeas, string beans, and garden peas.

The results showed that the aldehyde "in very small amounts is harmful to plants in distilled water and in nutrient solutions. It is harmful to plants grown in pots of soil. It greatly decreases the yield of crops grown in the field. It persists in the field soils for months. There is some evidence which suggests that lime and phosphate ameliorate the effects of salicylic aldehyde."

Of 14 poor garden soils examined 5 contained aldehydes, and of 30 unproductive field soils 9 contained aldehydes. Of 30 productive field soils examined 3 contained aldehydes. There appeared to be little or no relation between the occurrence of aldehydes and locality, soil type or texture, or crop grown.

Occurrence of aldehydes in garden and field soils, O. SCHREINER and J. J. SKINNER (*Jour. Franklin Inst., 178 (1914), No. 3, pp. 329–343, figs. 4*).—The substance of this article is contained in the bulletin noted above.

Contributions to our knowledge of soil fertility, VII–XI, R. GREIG-SMITH (*Proc. Linn. Soc. N. S. Wales, 38 (1913), pt. 4, pp. 725–746*).—In a continuation of previous investigations on the growth of bacteria in soils (E. S. R., 30, p. 322) the author studied the combined action of disinfectants and heat upon soils; soil toxins and their formation; the action of chloroform upon blood treated with vaselin; and the action of naphthalin in soil.

The effect of heat was found to be small compared with that of chloroform, and in the double treatment tests the differences between heat then chloroform and chloroform then heat were marked. Toxic extracts were obtained from soils, but it was found that the demonstration of toxins in soils depends upon obtaining a soil in which the toxins exceed the nutrients in amount. Equal parts of soil and water generally yielded the most toxic extract. It was further found that an accumulation of toxic substances does not occur in dry soils and that two kinds of bacteriotoxins exist, viz, those thermolabile in the soil and those thermostable in the subsoil. Soils were found to have a variable bacteriotoxic content. A soil originally toxic became nontoxic when washed with water and upon incubation again became toxic.

The ammoniacal fermentation of blood saturated either with paraffin or vaselin was not accelerated by chloroform treatment. While naphthalin induced an increase in the number of bacteria in unmanured soils, it is concluded that there is no corresponding increase in the formation of ammonia from the organic matter originally present or added as dried blood.

The sterilization or disinfection of the soil. F. BERTHAULT (*Jour. Agr. Prat., n. ser., 27 (1914), No. 17, pp. 523, 524*).—Various investigations bearing on this subject are briefly summarized, with the general conclusion that it is well established that sterilization of the soil by heat or antiseptic substances, such as carbon disulphid, tar liquor, toluene, and sulphur, is capable of greatly increasing the yield of crops although the mode of action of these substances has not yet been determined with certainty.

Special reference is made to box and plat experiments by Miège during 1912 and 1913 on the effect of partial sterilization of soil by toluene, carbon disulphid, sulphur, formic aldehyde, chloroform, tar water, creosote, acetic ether, naphthol, phenol, copper and barium sulphates, and potassium permanganate on mustard and barley. Boxes 0.43 meter square each received from 1 to 15 cc. of the liquids and from 0.2 to 2 gm. of the solids. Plats 10 meters square received from 50 to 200 cc. of the liquids and from 5 to 20 gm. of the solids.

Most of the substances used were beneficial especially in small doses. Barium sulphate, naphthol, and creosote were injurious. Copper sulphate was injurious in the box experiments but beneficial in the plat experiments.

Rock and soil in relation to plant nutrition. E. BLANCK (*Landw. Vers. Stat., 84 (1914), No. 5–6, pp. 399–425*).—Pot experiments were conducted with oats and peas using three kinds of granite, shale quartzite, and porphyry pulverized as the growth medium to determine the relative crop yields and extent to which the plant food in these rocks is available to plants. The yields of peas and oats were greater with the granites and porphyry than with the shale quartzite, but the plant food contained in the latter was better utilized than that in the granite and porphyry. A further proof of the author's views (E. S. R., 27, p. 520) that mica potash, especially that of biotite, is more easily available for plants than feldspar potash was obtained.

A comparison of the results with those obtained in sandstone experiments (E. S. R., 27, p. 513) showed that greater yields were obtained with the sandstone and that the sandstone plant food was better utilized.

Relation of the mineralogical and chemical composition to the fertilizer requirements of North Carolina soils. J. K. PLUMMER (*North Carolina Sta. Tech. Bul. 9 (1914), pp. 3–29*).—Chemical and mineralogical analyses of the mountain, Piedmont, and coastal plain soils of North Carolina are reported, together with a summary of the results of field experiments previously noted (E. S. R., 23, p. 635; 24, p. 336; 25, p. 721; see also p. 629).

A close relation is shown between the chemical and mineralogical composition and the fertilizer requirements of the soils. The mountain and Piedmont soils are usually better supplied with potash, lime, and phosphoric acid than the coastal plain soils. The micas are the principal sources of potash for the former types. The potash feldspars are much more abundant in the Piedmont than in the mountain soils, and orthoclase and microcline supply most of the potash in the coastal plain soils, on which the greatest response has been secured from the use of potash fertilizer. The phosphoric acid content of most North Carolina soils is small, being often found in the mountain and Piedmont soils in the practically unavailable form of apatite, included in quartz and other minerals. The coastal plain soils contain less available lime than the soils of the other sections and derive their main supply from epidote. In the Piedmont and mountain soils hornblende and plagioclase feldspars are found in larger quantities than in the coastal plain soils. Little difference is shown in the mineralogical composition of the soil and subsoil in each section.

Fertilizer experiments in the German colonies (*Düngvers. Deut. Kolon., Nos. 2 (1913), pp. VI+94, pls. 5, figs. 5; 4 (1914), pp. VI+90, pls. 4, figs. 9*).—Experiments with different fertilizers on a variety of crops in Kamerun, Togo, German New Guinea, and Samoa are reported.

Penguin guano from the Falkland Islands (*Bul. Imp. Inst. [So. Kensington], 12 (1914), No. 2, pp. 208–210*).—Five samples of penguin guano showing from 0.16 to 0.32 per cent of potash, 1.22 to 4.22 per cent of phosphoric acid (largely soluble in 2 per cent citric acid), and 0.96 to 1.71 per cent of nitrogen (mostly organic) are reported.

The samples as analyzed contained a high percentage of water, 64 to 80 per cent, and this in part accounts for the fact that the guanos contained much less fertilizing matter than good Peruvian guano.

Fertilizer factory for the Bahamas (*Daily Cons. and Trade Rpts. [U. S.], 17 (1914), No. 158, p. 140*).—The establishment of a factory for the preparation of fertilizers from loggerhead sponge and fish is suggested.

The atmospheric nitrogen industry in its economic relations, A. Perlick (*Die Luftstickstoff-Industrie in ihrer volkswirtschaftlichen Bedeutung. Leipsic, 1913, pp. 140; rev. in Chem. Ztg., 38 (1914), No. 40, p. 432*).—The technical methods of fixing the nitrogen of the air and their industrial and agricultural importance are discussed. The methods of Serpek and Haber are considered as most nearly solving the nitrogen problem for agriculture.

Influence of phosphatic and potash fertilizers on the chemical composition of meadow hay, C. Dusserre (*Ann. Agr. Suisse, 14 (1913), No. 4, pp. 271–273*).—Data are reported which show that fertilizers containing phosphoric acid, as well as those containing phosphoric acid and potash, not only increase the yield but also the nitrogen and phosphorus content of the forage. From 55 to 74 per cent of the phosphorus was found to be combined in mineral compounds or in phytin, 5 to 9 per cent in lecithin, and 21 to 40 per cent in nucleoproteids. The use of fertilizers doubled and in some cases quadrupled the phosphorus content, the greatest increase being in the mineral phosphorus.

Geology of the phosphate deposits northeast of Georgetown, Idaho, R. W. Richards and G. R. Mansfield (*U. S. Geol. Survey Bul. 577 (1914), pp. 76, pls. 14, figs. 3*).—This report briefly reviews the history of the discovery of the western phosphate field and presents in some detail a discussion of the structural geology, particularly as related to what has been named by the authors the "Bannock overthrust," of an area in addition to those reported in previous bulletins (E. S. R., 26, p. 125), comprising portions of Bear Lake and Bannock counties in western Idaho, in which are located the phosphate deposits of Georgetown Canyon.

The estimated available phosphate rock in this region is given as 1,347,370,000 long tons, which, added to the estimates for areas previously surveyed, gives a total tonnage for the area covered by detailed surveys to date of 2,663,290,000 long tons.

The chemical analyses already made indicate that clean rock from the thick workable beds usually maintains an average of over 32 per cent of phosphoric acid, but this percentage is increased somewhat in the weathered outcrops of the phosphate beds. The phosphate usually contains less than 1 per cent of iron or aluminum and hence is of good quality for the manufacture of superphosphates.

It is stated that too little is at present known concerning the land and the marine conditions that prevailed during the process of formation of the phosphate deposits to permit the formulation of a satisfactory hypothesis.

Note on certain phosphate deposits in western Madagascar, P. DE LA BATHIE (*Gouvt. Gén. Madagascar. Feuille Mens. Inform. Agr. et Com., 1914, Nos. 20, pp. 8–10; 21, pp. 10–12*).—Phosphatic nodules associated with marl and containing from 20 to 50 per cent of tricalcium phosphate are described.

The effect of ensilage fermentation and animal digestion on the solubility of phosphoric acid in phosphate rock, C. A. MOOERS (*Jour. Indus. and Engin. Chem., 6 (1914), No. 6, pp. 487, 488*).—Referring to an article by Forbes and Fritz (E. S. R., 31, p. 422), reporting results which indicate that the ensiling process may be used to render floats soluble and hence available both to animals and plants, the author reports experiments made at the Tennessee Experiment Station in which 2 lbs. of finely ground phosphate rock was mixed with over 100 lbs. of corn at the time the silo was filled and the resulting silage fed to cattle, with the result that although the silage was excellent in odor and appearance the animals refused to eat it after a short time. Extraction with 1 per cent nitric acid showed that the solubility of the phosphoric acid of the phosphate rock in the dung of the animals fed phosphated silage was increased only 3.28 per cent of the total phosphoric acid.

"Based on the assumption that all of the phosphoric acid was voided in the dung, the data at hand indicate that a reversion of the soluble phosphoric acid took place during the process of animal digestion. The general conclusion is indicated that the silo does not offer a practical means of making the phosphoric acid of phosphate rock available for plant use."

The effects of the ensilage process on the solubility and metabolism of floats, E. B. FORBES (*Jour. Indus. and Engin. Chem., 6 (1914), No. 7, p. 605*).—This is a reply to the criticisms by Mooers in the article noted above.

The effects of the ensilage process on the solubility and metabolism of floats, C. A. MOOERS (*Jour. Indus. and Engin. Chem., 6 (1914), No. 8, p. 695*).—A further discussion of this subject.

Potash (*Mich. Geol. and Biol. Survey Pub. 13, Geol. Ser. 10 (1913), pp. 93–96*).—The possibility of the discovery of potash salts associated with Michigan brines is briefly discussed. While the limited evidence so far collected is largely negative, the conclusion that there is no possibility of potash salts being found within the limits of the State is not considered warranted. Some of the difficulties and possibilities of drilling for potash salts are pointed out.

The lime factor theory, O. LOEW (*Die Lehre vom Kalkfaktor. Berlin, 1914, pp. 31. fig. 1*).—Investigations bearing on this subject are critically reviewed.

The question of sulphur in agriculture, E. MIÈGE (*Rev. Sci. [Paris], 52 (1914), I, No. 25, pp. 778–784*).—Investigations on this subject are reviewed in relation to their bearing on the direct and indirect action of sulphur on the growth of plants, but attention is called particularly to a theory explaining the

action of sulphur as due to its absorption of the oxygen of the soil while leaving the nitrogen free to be utilized by the nitrogen-fixing bacteria.

Analyses of fertilizers, spring season, 1914, B. W. KILGORE ET AL. (*Bul. N. C. Dept. Agr., 35 (1914), No. 6, pp. 85*).—This bulletin contains analyses and valuations of fertilizers collected by the fertilizer inspectors of the state department of agriculture during the spring of 1914, as well as a list of brands of fertilizers registered for sale during the spring season.

Analyses of commercial fertilizers, P. H. WESSELS ET AL. (*Rhode Island Sta. Insp. Bul., 1914, June, pp. 8*).—This contains analyses and valuations of samples of fertilizers, collected in the spring of 1914, which the manufacturers designated as potato fertilizers. It also contains analyses and valuations of bones, fish, and tankage collected during the season.

AGRICULTURAL BOTANY.

Comparative morphology of some Leguminosæ, J. N. MARTIN (*Bot. Gaz., 58 (1914), No. 2, pp. 154–167, pls. 4*).—A study was made of the development of the embryo sac, embryo, and endosperm of *Trifolium pratense*, *T. hybridum*, *T. repens*, *Medicago sativa*, and *Vicia americana*.

Among some of the contrasting features observed, the author found that the number of ovules is always two in *T. pratense*, but more than two in the other species. In Trifolium the embryo sac rapidly destroys the antipodal end of the nucellus, and thus forms a long tubular sac. The embryo sac remains vacuolate in Trifolium, while in Vicia and Medicago it is filled with cytoplasm. In Trifolium and Vicia the starch appears in the micropylar end of the nucellus and in the inner integument, while it fills the sac in Medicago. Sterility was found most marked in *T. pratense*.

A study of the germinating power of seeds, M. L. DARSIE, CHARLOTTE ELLIOTT, and G. J. PEIRCE (*Bot. Gaz., 58 (1914), No. 2, pp. 101–136, figs. 18*).—By means of silvered Dewar flasks, the use of which has been previously described (E. S. R., 20, p. 734), the authors have made a study of the germination of seed of corn, oats, wheat, clover, barley, and hemp of known age to determine the viability of the seed as influenced by age.

It was found that with the different seeds the germinating power and vigor of growth is indicated by determining the temperatures which they will develop in Dewar flasks under conditions suitable for germination. Each species of plant studied appears to have a normal temperature, departures from which indicate departures from the best condition of the organism. Temperatures in excess of normal indicate an infection of the seed, while subnormal temperatures indicate lessened vigor. Decreased vigor was generally found due to increased age. Departures from normal temperatures were found to be accompanied by differences in amount of growth immediately following germination, and it is thought that possibly this might be true of the other stages in the growth of the plant, although this was not investigated.

A physiological study of the germination of Avena fatua, W. M. ATWOOD (*Bot. Gaz., 57 (1914), No. 5, pp. 386–414, figs. 13*).—Results of studies testing the relations of germination to water intake, wounding, oxygen access and absorption, acidity, etc., are given.

It is claimed that after-ripening of seed in wild oats occurs along with drying of the seed, but independently of the water content and also of the seed coats as controlling the entrance of water. Their removal, however, hastens germination, although this is independent of light. The delay in germination is attributed to a restriction of the oxygen supply, due to the seed coat, as shown by the hastening effect of breaking or searing these coats, removal of the

embryo, increasing and decreasing the oxygen concentration, and direct measurement of the oxygen intake with intact and seared seeds, and with seeds in varying concentrations of oxygen. It is thought that after-ripening may consist in an increased permeability of the seed coat to oxygen, together with a rise in the embryo acid content, which is accompanied by an increased water absorbing power of the embryo.

A bibliography is appended.

Transpiration in relation to growth and to the successional and geographic distribution of plants, A. DACHNOWSKI (*Ohio Nat., 14 (1914), No. 4, pp. 241–251*).—Discussing the results of work previously reported (E. S. R., 28, p. 733), the author considers it probable that the absorbing power of the root system of a plant is not regulated by the amount of water transpired but by the differential permeability of the absorbing epidermal root cells and the metabolic requirements during the life cycle; that absorption of inorganic and organic constituents is not connected with transpiration but with metabolism; and that no direct relation exists between growth, green and dry weight of plants, and transpiration, even under the same conditions of experiment. The rate and amount of growth and final size of a plant depend in part on favorable conditions of temperature, light intensity, food supply, and amount of water present in the plant, the rate or total amount of water transpired giving no indication as to the quantity normally required for metabolic processes and for growth. It is held that the quantity of transpiration water in most plants is not coordinated with or directly related to the absorption and translocation of solutes or to the green and dry weight of plants, that it is not an index of metabolism and growth or vegetable luxuriance, but that it has its own advantages, such as protection from high temperatures in direct sunlight and aid in gaseous exchanges. It is thought that transpiration may be a factor in determining the final form of plants.

The physiological water requirement and the growth of plants in glycocoll solutions, A. DACHNOWSKI and R. GORMLEY (*Amer. Jour. Bot., 1 (1914), No. 4, pp. 174–185; abs. in Science, n. ser., 39 (1914), No. 1017, p. 956*).—This paper, though regarded as of a preliminary nature, continues physiological studies of Dachnowski (see above).

Tabulated results are given of experiments with bog plants tested in regard to transpiration and growth in glycocoll solutions of varying strength. It is stated that the transpirational water loss in the experiments cited is a function of the vapor pressure of the water, affected by the quantity of salts in solution and the factors modifying the atmospheric conditions. The absorption of glycocoll is not connected with the transpirational water loss, but with the differential permeability of the absorbing root cells, with the efficiency of the nutritive metabolism characteristic of the plants, and with the amount of water retained within the plants.

The insufficiency of a salt operates as a limiting factor to growth, but transpiration does not decrease consistently with retardation thereof. The amount of water retained is decreased when the strength of the solution passes a certain optimum concentration, the available water rather than the solute becoming then the limiting factor, unlike plants reacting differently to physiologically limiting water conditions. The variations appear to be inherent peculiarities of the growth capacity and metabolism of plants. Plants may show loss in weight without a corresponding loss in amount of water transpired, or an increase of growth may occur with little or no increase in transpiration. A decrease in the increment of body weight may arise through faulty nutrition and enforce compensating processes. Weaker acid solutions are more effective than stronger solutions in affecting the hydration capacity of tissues,

and thus in increasing the transpiration of plants (but not their growth). The retention of water is the physiological function correlated with and indispensable to growth in general, and to survival and greater areal distribution of the plants entering physically or physiologically arid habitats.

The tensile strength of sap, H. H. DIXON (*Sci. Proc. Roy. Dublin Soc., n. ser., 14 (1914), No. 16, pp. 229–234*).—The author has investigated the tensile strength of the sap of beech and other trees and found that it does not differ materially from that of water. In the few experiments made the ease with which tension was generated and its magnitude before rupture occurred are believed to indicate that sap is somewhat more stable under tension than pure water.

Oxidases and their inhibitors in plant tissues, I–III. W. R. G. ATKINS (*Sci. Proc. Roy. Dublin Soc., n. ser., 14 (1913), No. 7, pp. 144–156; 14 (1914), Nos. 8, pp. 157–168; 11, pp. 199–206*).—The author has given a detailed account of investigations on the distribution of oxidases in certain tissues, a large number of plants having been examined.

Special studies were conducted on the occurrence of oxidase in *Iris germanica*. It was found that in the leaf of this plant there exists a substance which prevents the detection of oxidases by the direct application of guaiacum solution and hydrogen peroxid.

In the second paper the author reports studies to determine qualitatively the effect of light and darkness upon the oxidases and reducing substances of the Iris leaf and their relationship to the production of color in the flower of Iris. Prolonged darkness is said to have no decided effect upon the distribution of the indirect oxidase (peroxidase) reactions or of the inhibitor in the leaf of *I. germanica*. The distribution of the oxidase and inhibitor in the flowers of a number of varieties of Iris was examined and correlated with the natural coloring of the flowers, the author concluding that the behavior of Iris flowers closely follows that of other species reported by Keeble, Armstrong, and Jones (E. S. R., 29, p. 421; 30, p. 129).

The concluding paper gives an account of a study on the localization of oxidases and catalase in some marine algæ. Catalase was found in all of the 29 species studied. Only one species gave a direct oxidase reaction with guaiacum while six gave an indirect reaction with hydrogen peroxid. The presence of water-soluble phycophæin in small quantity during life and its reduction to a colorless substance at death is suggested as an explanation of the much discussed color change occuring in brown algæ.

Bibliographies are appended to the different papers.

The production of anthocyanins and anthocyanidins, A. E. EVEREST (*Proc. Roy. Soc. [London], Ser. B, 87 (1914), No. B 597, pp. 444–452*).—The author, presenting experimental data, claims to have demonstrated the production of anthocyanins from yellow glucosids and states that in cases where hydrolyzed solutions were taken only anthocyanidins were produced, claiming that these facts with others cited oppose the hypothesis offered by Miss Wheldale (E. S. R., 21, p. 726) to the effect that anthocyanin pigments are the oxidation products of colorless or faintly colored chromogens and that these chromogens are products of hydrolysis of glucosids present in the tissues of the plant. Studies previously published by the author in connection with Willstätter (E. S. R., 30, p. 324), also reports by Keeble, Armstrong, and Jones (E. S. R., 30, p. 129), are considered to have shown that if the anthocyanins are produced from the yellow glucosids, it must be by some interaction in which the glucosids and not the hydrolyzed glucosids take part and that anthocyanin pigments are not oxidation, but reduction, products of the yellow glucosids.

The relation of cultivated plants to certain soil salts, III, B. HANSTEEN CRANNER (*Jahrb. Wiss. Bot. [Pringsheim], 53 (1914), No. 4, pp. 536–602, pls. 3, figs. 5*).—This report gives a fuller and more detailed account of studies by the author, previously noted from another source (E. S. R., 28, p. 426), and following up earlier communications on the same subject (E. S. R., 23, pp. 28, 328).

Effect of strongly calcareous soils on the growth and composition of certain plants, P. L. GILE and C. N. AGETON (*Porto Rico Sta. Rpt. 1913, pp. 14, 15*).—A study has been made of pineapples, beans, radishes, sugar cane, sweet cassava, and rice to determine the effect of varying the quantity of carbonate of lime upon their growth and composition.

Some plants showed a variation in their ash composition, but in general the results indicate that if a soil is not absolutely deficient in calcium it is useless to attempt to increase the lime content of forage plants by liming the soil.

Quantitative criteria of antagonism, W. J. V. OSTERHOUT (*Bot. Gaz., 58 (1914), No. 2, pp. 178–186, figs. 4*).—In order to bring about more uniform methods of determining antagonism, the author presents data which indicate that the method of mixing equally toxic solutions furnishes the best criterion of antagonism, since it is known at the outset just what effect each mixture must have, provided there is no antagonism. Mixtures of two equally toxic solutions must have precisely the same effect on growth as the pure solutions themselves, provided the effects of the salts are additive. If antagonism exists, there is an increased growth in the mixtures, and the amount of this increase, expressed as percentage of the growth obtained in the pure solutions, is the most satisfactory measure of antagonism. It is said that the most reliable results may be obtained by the use of uniform material and by taking for measurement only such parts as come into immediate contact with the solution.

The effect of one crop upon another, DUKE OF BEDFORD and S. U. PICKERING (*Jour. Agr. Sci. [England], 6 (1914), No. 2, pp. 136–151, pl. 1*).—In continuation of their investigations (E. S. R., 26, p. 639), in which the authors claim that grass roots interfere with the growth of orchard trees, experiments were carried on in earthenware pots in which tobacco, tomatoes, barley, and mustard each were grown in one pot, surrounded by a second containing the same kind of soil, but in which was grown not only various grasses, clovers, etc., but the same plants as in the first pot.

The results of this investigation are given in some detail, and it is claimed that every growing crop results in the formation of a substance which is toxic to the growth of other plants and still more so to itself. By oxidation this toxin loses its toxic properties and enhances the fertility of the soil. The toxic effects is found to vary with the nature of the soil, the kind of plant, and the vigor of growth. There is not believed to be any reason for assuming the excretion of any toxic matter from a plant, as the débris from the growing roots is believed sufficient to account for the formation of toxin. Heating of soil produces toxic matter from organic substances present in it and in much greater quantities than that produced by the growth of a crop. In both cases the toxin, after oxidation, increases the fertility of the soil.

The spread of morbid changes through plants from branches killed by heat, H. H. DIXON (*Sci. Proc. Roy. Dublin Soc., n. ser., 14 (1914), No. 12, pp. 207–210, figs. 2*).—In a previous publication (E. S. R., 17, p. 452) the author has shown that if a branch of a plant is killed by heat and the rest of the plant supplied with water through this branch, some of the leaves on the uninjured branches may become injuriously affected. Further studies have shown that branches killed by heating them with steam and afterwards supplying them

with water often have some of their leaves visibly affected, indicating that changes are produced in the sap which are largely responsible for the alterations in the leaves above, and these changes should not be attributed to the cutting off of the water supply, but rather assigned to its contamination.

The effect of city smoke on vegetation, A. L. BAKKE (*Iowa Sta. Bul. 145 (1913), pp. 383–409, pl. 1, figs. 22*).—A report is given of a study of the smoke problem in Des Moines, Iowa, in which a discussion is given of the sources of smoke, various smoke belts, their characteristics, and the susceptibility of plants to smoke. Some investigations were conducted on the nature of smoke, physiological factors in plant injuries, the effect of different smoke constituents, and the relation of smoke to the storage of material in plants.

It was found that about manufacturing plants the region may be mapped off in concentric belts, each represented by certain forms of plant life, as some species are more susceptible to smoke injury than others. On account of their resistance to smoke, certain plants are recommended for planting about industrial centers.

Toadstools and mushrooms of the countryside, E. STEP (*London [1913], pp. XVI+143, pls. 136*).—Popular descriptions are given of a considerable number of mushrooms, with notes on their distribution, habitat, edible or poisonous qualities, etc.

FIELD CROPS.

The effect of soil moisture, plant food, and age on the ratio of tops to roots in plants, F. S. HARRIS (*Jour. Amer. Soc. Agron., 6 (1914), No. 2, pp. 65–75*).—In this paper previous literature on this subject is reviewed and results given of pot experiments conducted at the Utah Station in which wheat, corn, and peas were grown in soil extracts, sand, and clay loams that were of varying concentrations and of different moisture content and differently fertilized.

The results "show with wheat seedlings growing in soil extracts the green weight, dry weight, and length of roots was proportionately greater in the dilute than in the concentrated soil extract. Corn, wheat, and peas growing a number of weeks in sand containing different amounts of moisture showed a proportionately greater root growth in the drier sand. Corn grown in glass tubes 75 days showed a relatively greater root growth where the level of free water was a considerable distance below the surface. Different roots of the same corn plant grown in very wet and in moist sand showed a greater root growth with the lower amount of water.

"Tests with corn and wheat showed that the ratio of tops to roots was affected by soil moisture even during the germination stage. Wheat harvested at different stages showed relatively more roots during early stages of plant growth than later. Wheat grown to maturity showed a greater relative root growth with low than with high soil moisture, and the moisture during the early stages of growth had the greatest influence on that ratio. Fertilizers added to the soil reduced the relative root growth of wheat."

Fertilization and cultivation of corn, cotton, and tobacco, C. B. WILLIAMS (*North Carolina Sta. Circ. 18 (1914), pp. 16*).—This gives fertilizer formulas for corn and cotton on land in fair condition in the coastal plain section and in the Piedmont section, and also for tobacco.

Annual report, 1913–14, R. E. BLOUIN and A. H. ROSENFELD (*Rev. Indus. y Agr. Tucumán, 4 (1914), No. 9–10, pp. 369–492, pl. 1, figs. 21*).—This report summarizes the work at the experiment station at Tucumán, Argentina, in varietal, manurial, and cultural tests with sugar cane, maize, cotton, and legumes for the calendar year 1913.

Physiological correlations and climatic reactions in alfalfa breeding, G. F. FREEMAN (*Amer. Nat., 48 (1914), No. 570, pp. 356–368, fig. 1*).—This paper discusses the factors of temperature, relative humidity, and water supply in their relation to development, yield, and chemical composition of 44 regional varieties of alfalfa grown at the experiment station farm at Phoenix, Ariz., and gives tables showing the correlation between stand and yield, between nitrogen content of hay and percentage of leaves, between nitrogen content of hay and nitrogen content of leaves, between percentage of leaves and stand, between percentage of leaves and height, between percentage of leaves and yield, and between nitrogen content of hay and period required for maturity.

It is noted that in respect to yield "the different regional varieties take the following relative order: Peruvian, European, Turkestan, American, and Mediterranean. It is here noticeable that though the European and Mediterranean varieties have similar seasonal yield curves they are not contiguous in the arrangement based on total yields. This is a result of a market difference in the stand maintained by the two varieties, which averaged 92 per cent for the former and 74 per cent for the latter. In their ability to maintain stand, the Peruvian, European, Turkestan, and American varieties were about equal, averaging 92, 92, 93, and 94 per cent, respectively. The lack of stand on the part of the Mediterranean alfalfas was not due to the poor quality of the original seed, for all of these plats once had perfect stands."

The author concludes that "in economic plant breeding one frequently encounters physiologically negative correlations, such as those in alfalfa, between height, stooling capacity, height and percentage of leaves, and between yield and quality. In seeking improvement, therefore, the breeder must recognize and make use of these facts in the interpretation of results obtained, and also search for races which violate such naturally antagonistic correlations to the greatest possible extent."

The cultural value of Turkestan alfalfa, G. BOHUTINSKÝ (*Monatsh. Landw., 7 (1914), No. 3–4, pp. 73–81, fig. 1*).—The results of trials here given indicate a superiority of Hungarian over Turkestan alfalfa.

A new method of growing corn, C. C. CUNNINGHAM (*Jour. Amer. Soc. Agron., 6 (1914), No. 2, pp. 84–88, figs. 2*).—The author describes a method of planting corn that has been successfully tried out in western dry-land conditions of western Kansas. By this method the corn is planted in rows twice the usual distance apart while the plants are twice as thick in the row. The stand is therefore the same, but as this method seems to preserve the moisture midway between the rows the supply is often sufficient to maintain the corn in a flourishing condition during temporary periods of drought, while occasionally it may complete the development of the crop. It is noted that by this method the yields were around 30 bu. per acre while adjoining fields in which the rows were 3½ ft. apart the yields were only 10 to 12 bu. per acre.

Variety tests of corn for 1913, G. M. GARREN (*Bul. N. C. Dept. Agr., 35 (1914), No. 2, pp. 16*).—This bulletin gives data in tabular form covering about 40 varieties of corn grown in 1913 at the test farms at Buncombe, Iredell, Central Station, and Edgecombe, and summaries of yields of certain varieties grown at Iredell and Edgecombe in 1909–1913, inclusive.

Brief notes discuss these results and point to the varieties, Weekly Improved and Biggs Seven Ear, as most suitable for North Carolina.

Fertilizer experiments with cotton on the sandy loam soils (Norfolk sandy loams) of the coastal plain, B. W. KILGORE, C. B. WILLIAMS, G. M. MACNIDER, and R. W. SCOTT, JR. (*Bul. N. C. Dept. Agr., 35 (1914), No. 4, pp. 48*).—This bulletin continues previous work (E. S. R., 24, p. 336), and reports the results of experiments with cotton to determine the fertilizer needs of the coastal plain soils.

The main increased yields and profits came from the use of nitrogen and potash. With phosphoric acid and potash the yield was slightly greater than with nitrogen and phosphoric acid, but not nearly so great as with nitrogen and potash. Nitrogen added to phosphoric acid and potash, making a complete fertilizer, apparently increased the yield and gave an additional profit. The application of lime alone was in general accompanied with some profit.

Tests of the effect on the yield of cotton of varying quantities of nitrogen, leaving the phosphoric acid and potash constant, indicated that nitrogen is one of the controlling constituents, if not the most important one, for crop production on this soil. Corresponding tests of the effect of varying the quantities of phosphoric acid and potash showed no very marked effect on the yield of cotton, and indicated that their application is not accompanied with much profit. Tests of the comparative value of dried blood and nitrate of soda as sources of nitrogen for cotton showed them to be about equally satisfactory.

Experiments on the effect of different methods and time of application of fertilizer showed that it made very little difference whether all the fertilizer was applied in the drill before planting or whether one half was put in the drill before planting and the remainder applied as a side dressing about July 1, according to season.

Information regarding varieties, culture, and fertilization of cotton on these soils is appended.

Fertilizer experiments with cotton on Piedmont Cecil sandy loam soil, and varieties, culture, and fertilization of cotton on Piedmont Cecil sandy loam and red clay soils, C. B. Williams, B. W. Kilgore, and A. R. Russell (*North Carolina Sta. Bul. 227 (1914), pp. 5–52*).—Part 1 of this bulletin gives results of a study to determine the proper fertilization for cotton on Piedmont Cecil sandy loam and similar soils. "The use of a mixture carrying normal amounts of phosphoric acid and nitrogen gave an average increased yield of seed cotton per acre of 43 per cent over the yield secured on the same character of land without fertilization. The net profit over cost of fertilizer of this combination was $15.14 per acre. Where a normal amount of potash was used with the phosphoric acid in place of the nitrogen there was an average increase in yield of 46 per cent of seed cotton and an average profit over cost of fertilizer used of $19.17 per acre."

The use of a fertilizer mixture carrying normal amounts of nitrogen and potash was far less effective and profitable, the average net profit per acre being only $4.84 per acre. Nitrogen, phosphoric acid, and potash combined in a complete fertilizer yielded on an average only slightly more than when nitrogen was left out of the mixture.

Lime alone was used at a very small profit, while in a complete fertilizer it has shown up on an average to a slightly better advantage. "Slightly the largest profit per acre was secured by applying all the nitrogen along with the phosphoric acid and potash before planting, having four-fifths of it derived from dried blood and one-fifth from nitrate of soda. . . . The most profitable method, everything considered, of applying the fertilizer mixture, the results would seem to indicate, would be in the drill at planting time at the ordinary depth. . . . For the conditions prevailing and the length of time covered by the experiments comparing the relative value of acid phosphate, basic slag, and finely ground phosphate rock, the former material was found to be decidedly the most efficient and profitable carrier of phosphoric acid for cotton."

Part 2 gives suggestions to growers of cotton on Piedmont sandy loam and red clay soils as to varieties, culture, and fertilization.

Results of variety tests of cotton in Mecklenburg County, C. B. WILLIAMS (*North Carolina Sta. Circ. 16 (1914), pp. 4*).—This circular describes tests on two types of soil.

The results are reported as emphasizing the importance of using the best of the early maturing varieties on a rather stiff clay soil of the Piedmont portion of the State, especially if the section is near the limit of the growth of cotton. For the Cecil sandy loam with a red clay subsoil, the best of the later varieties will, in many cases, produce the greatest net return per acre.

Testing cotton seed for germination, W. C. LASSETTER (*Arkansas Sta. Circ. 22 (1914), pp. 2*).—A practical method for testing cotton seed and corn is described.

Spinning tests of upland long-staple cottons, F. TAYLOR and W. A. SHERMAN (*U. S. Dept. Agr. Bul. 121 (1914), pp. 20*).—This bulletin discusses soil types represented, variations in grades and staple, lengths, invisible loss, card waste, relation of grade to waste, comparisons at the comber, comber tests, value of waste differences, accuracy of machine work, factors influencing waste, tests of breaking strength, and cultural characteristics, compares early and late picked cotton, and gives data on tests made at the New Bedford Textile School.

"These tests show that careful breeders in the Carolinas are producing cotton fully equal in almost every respect to average Deltas of the same length. They also show that several strains now grown in commercial quantities in the Southeast are less wasty than average Deltas, although not so strong. These varieties are earlier, have larger bolls, and are usually more prolific than Delta types. These uniform varieties are the result of intelligent breeding work. The importance to the spinner of such work can hardly be overestimated. It suggests the wisdom of more direct dealing between spinners and careful producers, that the latter may be guarantied suitable premiums for their superior products."

A new cover crop, W. G. CRAIB (*Roy. Bot. Gard. Kew. Bul. Misc. Inform., No. 2 (1914), pp. 76, 77*).—A description of a leguminous plant (*Dolichos hosei*) indigenous to Sarawak and grown experimentally at Kuala Lumpur. It is noted as proving a successful cover crop and as growing from cuttings.

Notes on a creeping bean, E. HOSE (*Agr. Bul. Fed. Malay States, 1 (1913), No. 7, p. 276*).—The plant noted above is described and its successful cultivation as a cover crop reported.

Mireken nuts [candle nut] (Aleurites moluccana) (*Agron. Colon., 1 (1914), No. 10, p. 120*).—The analyses here given show the fat to range from 62.48 to 67.12 per cent and the protein from 19.4 to 25.3 per cent.

Oats, M. NELSON and C. V. RUZEK (*Arkansas Sta. Bul. 118 (1914), pp. 625–637, fig. 1*).—In this bulletin are given the methods and results of several years' cultural variety tests.

For winter oats variety-test-yields reached up to 54.5 bu. per acre during 1909–1913 and spring oats up to 65 bu. It was found that the winter varieties produce taller straw, larger yields per acre, and heavier grain per bushel than do the spring varieties, but the spring varieties mature earlier and stand up better. Virginia Turf, Winter Gray, Winter Turf, and Snoma are the best winter varieties included in these tests, and Burt, Hybrid No. 45, Red Rust Proof, and Daubenny the best spring varieties. The northern varieties of oats have not given good results in comparison with the other varieties.

For the northern part of the State the results indicate that the first half of March is the best time for seeding spring oats, while for the central and southern part of the State the last half of February is preferable. For the northern part of the State the latter half of September gives best results of seeding winter oats, but for the central and southern parts of the State the first two

weeks in October are preferable. As an average of five years' tests, seeding spring oats at the rate of 10 and 12 pk. per acre gave the best and most economical returns.

On the assimilation of soil constituents by oats, J. W. PATERSON and P. R. SCOTT (*Jour. Dept. Agr. Victoria, 12 (1914), No. 4, pp. 193–201, fig. 1*).—In making these determinations the crop was divided into roots; straw, including stems, leaves, floral axes, and chaff; and grain, including flowers or fruit with the poles. Nitrogen, potash, lime magnesia, phosphoric acid, and silica were determined at three harvestings: (1) Just before flowering, (2) the plants well headed with the lower leaves turning yellow, and (3) the crop ripening.

The results showed that "the oat crop forms about 95 per cent of its substance from the air. The necessary soil constituents form only a small part of the crop by weight. Seven soil constituents are essential. Each of them is absorbed in solution. 'Deficiency' in any constituent means deficiency in a soluble form. In such a case the crop will also be deficient. With most of the soil constituents the acid reaction of living roots helps in their solution. This solvent action requires time.

"Nitrogen and potash cease to be absorbed by the oat plant about the time of full bloom. This fact renders a larger available supply of these constituents necessary at seed time than would otherwise be the case. The absorption of phosphoric acid continues to a later stage of vegetation. This fact is in favor of the action of phosphatic manures. Silica is absorbed still later than phosphoric acid, and as long as the plant is green. Silica is not a plant food. Little or none of the phosphoric acid absorbed is afterwards lost to the plant.

"These experiments show that a good deal of the absorbed nitrogen and still more of the potash may be lost. It is not clear that the lost substances were useful, although such losses are probably inevitable in oats grown under field conditions. Materials absorbed and excreted by the plant impose no extra drain upon the soil for subsequent crops."

Paddy cultivation in Ceylon during the nineteenth century, E. ELLIOTT (*Trop. Agr. and Mag. Ceylon Agr. Soc., 37 (1911), Nos. 3, pp. 225–232; 4, pp. 305–312; 5, pp. 393–397; 6, pp. 501–507, 559; 38 (1912), Nos. 1, pp. 21–31; 4, pp. 313–318; 5, pp. 403–408; 6, pp. 506–511; 39 (1912), Nos. 1, pp. 21–24; 2, pp. 118–125; 3, pp. 235–238; 40 (1913), Nos. 2, pp. 115, 116; 3, pp. 100–102; 6, pp. 322–326; 41 (1913), Nos. 2, pp. 116–119; 3, pp. 203–205; 4, pp. 286–290; 5, pp. 393, 394; 6, pp. 465–467; 42 (1914), Nos. 2, pp. 98–100; 4, pp. 286–290; 5, pp. 381–383*).—This article consists of a study of the rice industrial and cultural conditions, including a statistical review and descriptions of cultural and market conditions of the century in successive periods.

New varieties of rice imported from Japan in 1913, P. POLI (*Gior. Risicolt., 4 (1914), No. 8, pp. 115–117, figs. 4*).—Two varieties of rice are here described that were introduced into Italy from Japan.

Preparation of seeds of the sugar beet, S. VON WILKONSKI (*Bl. Zuckerrübenbau, 21 (1914), No. 8, pp. 121–126*).—Results of experiments are given in which beet seeds were soaked in a water solution of superphosphate (25° Brix) for from 7 to 9 days and then planted in comparison with unfertilized and fertilized seeds. In general the treated seeds gave more satisfactory results than the untreated, although not uniformly so.

Cultural experiments with artificially dried beet seeds in Hungary in 1912, B. VON JANCSÓ (*Österr. Ungar. Ztschr. Zuckerindus. u. Landw., 43 (1914), No. 2, pp. 174–188*).—This paper reports a continuation of work previously noted (E. S. R., 29, p. 739), showing practically identical results, i. e., that while laboratory experiments showed a better percentage of germination of seeds and somewhat more thrifty plants, yet no practical difference could be detected from point of yield in field experiments.

It is also noted that root blight was not reduced by the drying methods, except in the laboratory experiments. This advantage was attributed to a more vigorous early growth which the dried seed seemed to induce.

On the character of beets derived from the same seed ball, O. MUNERATI, G. MEZZADROLI, and T. V. ZAPPAROLI (*Staz. Sper. Agr. Ital., 46 (1913), No. 9, pp. 576–588, figs. 9; Suer. Indig. et Colon., 83 (1914), Nos. 5, pp. 105–110, figs. 8; 6, pp. 130–134, fig. 1*).—The results show that beets, whether sugar beets, semisugar beets, or stock beets, grown from the same ball present the same variety in form and sugar content that may be noted in field culture. There seemed to be no relation between the weight of individual beets and the sugar content.

A method of planting seeds in sectional cylinders, from which the young plants may be transplanted when they have developed from 4 to 6 leaves, and which has proved successful in obtaining beets of uniform and regular form, is described. It is noted that by the time the plants have attained a development of from 4 to 6 leaves the root form is determined.

The weight and sugar content of sugar beets in relation to the area at the disposition of each plant in the field, O. MUNERATI, G. MEZZADROLI, and T. V. ZAPPAROLI (*Staz. Sper. Agr. Ital., 46 (1913), No. 11–12, pp. 755–779, figs. 6*).—In a study of this question with sugar beets, semisugar beets, and stock beets the authors conclude that the condition of the soil has more to do with the points in question than the spacing.

On the fluctuation of nitrogen content in sugar beets of the same parentage, F. STROHMER, O. FALLADA, and L. RADLBERGER (*Österr. Ungar. Ztschr. Zuckerindus. u. Landw., 43 (1914), No. 2, pp. 193–207, figs. 6*).—The results here reported showed no relation between the absolute weight or dry matter and the nitrogen content of beets, but well-bred beets of the same parentage showed a variation of nitrogen content of less than 0.1 per cent.

The wild cotton plant (Thurberia thespesioides) in Arizona, V. BAILEY (*Bul. Torrey Bot. Club, 41 (1914), No. 5, pp. 301–306, figs. 2*).—This article describes the wild cotton plant, *Thurberia thespesioides*, found in Arizona, giving its zonal range and a list of other plants generally associated with it.

The state grain laboratory and the Montana seed laws, A. ATKINSON and B. W. WHITLOCK (*Montana Sta. Circ. 30 (1913), pp. 73–88*).—This circular describes the purpose of the state grain laboratory, gives the text of the state laws establishing it and providing for seed inspection, and rules and regulations promulgated.

On germination tests in natural mediums, W. OETKEN (*Fühling's Landw. Ztg., 63 (1914), No. 5, pp. 167–177*).—To test the value of field soil as a medium for making germination tests of seeds, the author placed wheat kernels in loam, humus, and clay soils at 2, 3, and 4 cm. depths, ranging from 5 to 15° C. in temperature, and the soils moistened to from 40 to 70 per cent of saturation. The results were inconclusive.

Minnesota weeds, II, W. L. OSWALD and A. BOSS (*Minnesota Sta. Bul. 139 (1914), pp. 47, figs. 25*).—This bulletin contains illustrations and descriptions and gives methods of eradication of 24 kinds of weeds, in continuation of work previously noted (E. S. R., 28, p. 836).

Eradication of wild mustard, RECH (*Landw. Ztschr. Rheinprovinz, 15 (1914), No. 22, pp. 402–404, figs. 2*).—The results here given show that calcium cyanamid applied to oat fields at the rate of about 25 lbs. per one-half morgen (79.3 lbs. per acre) while the dew was on completely destroyed wild mustard, and while the growth of the oats was temporarily checked the final effect of the nitrogen was a vigorous growth.

A mixture of 15 lbs. calcium cyanamid to 100 lbs. of kainit also destroyed the weed and improved the growth of the oats.

On the conservation of the vitality of weed seeds in lower strata of cultivated soils, O. MUNERATI and T. V. ZAPPAROLI (*Staz. Sper. Agr. Ital., 46 (1913), No. 5, pp. 347–371, fig. 1*).—The factors heat, moisture, oxygen, light, and compression are discussed as influencing the vitality of the seeds and their germination when exposed to the surface by plowing and cultivation. The condition of the seed at the moment it becomes buried is considered the most important factor.

The effect on the germinative ability of seeds of Orobanche crenata by passing them through cattle and by fermentation of the feces, A. MORETTINI (*Staz. Sper. Agr. Ital., 46 (1913), No. 9, pp. 589–606*).—The results of feeding animals with forage containing these seeds are given as follows: Digestion by cattle and horses did not reduce the germinative ability, even when the seeds remained in the digestive tract from 12 to 48 hours; the seeds lost their germinative ability in the fermentation of the manure; the destructive action of the manure was in causing the decomposition of the seeds; and well-rotted manure was not a means of infection.

HORTICULTURE.

Large seed a factor in plant production, M. B. CUMMINGS (*Vermont Sta. Bul. 177 (1914), pp. 89–123, pls. 4*).—The author here reports a series of experiments conducted with seeds of a number of plants, including sweet peas, sweet pumpkins, Hubbard squash, lettuce, beans, parsley, radishes, spinach, and garden peas with the view of determining the relative value of large and small seed on plant production. The results are here presented in tabular form and fully discussed.

The experiments as a whole show a distinct advantage in using large and heavy seed. In the case of sweet peas large and heavy seed resulted in earlier blooming, a larger total number of blossoms, and a larger number of blossoms of good quality. The plants also were heavier and more prolific and thrifty. Small squash and pumpkin seed gave a larger number and a greater total weight of fruit, but were markedly inferior with reference to number and weight of ripe fruit. The use of large lettuce seed resulted in the production of larger seedlings, an increased weight of edibly matured plants which displayed better heading-up capabilities, earliness, and uniformity. Of the crops tested, garden peas alone made little or no response to size selection of seed when the seed was harvested as green peas. There was a slight gain for plants from large seed allowed to mature. Large bean seed gave an earlier product, but at the same time the large seed was slower in germinating. Some observations were made of the place origin of small seeds in pods of beans and peas. In beans 49 per cent of the small seed were found to occur in the basal end, while 18 per cent occurred in the middle of the pod. In the garden peas the small seeds were almost always found at the ends of the pods, with one end as prolific as the other.

Report of the horticulturist, C. F. KINMAN (*Porto Rico Sta. Rpt. 1913, pp. 16–21, pls. 2*).—Investigations with fruits, vegetables, and miscellaneous plants were continued along the lines previously noted (E. S. R., 29, p. 637).

Although the cooperative fertilizer experiments with citrus fruits were practically closed during the previous year, the plats on which the effects of muriate and sulphate of potash were being compared were continued. The results again show that there is no great difference between these two fertilizers and that the general belief among Porto Rican growers that muriate of potash is injuri-

ous to citrus trees is not well founded. The beneficial effect of fertilization on the citrus groves throughout the island was more noticeable during the year than ever before. Experiments are being conducted to determine whether the time of blooming of the citrus trees can be influenced by the application of fertilizers at certain seasons of the year.

Experiments with leguminous green-manure and orchard cover crops were continued and a number of new varieties tested. Among the most promising of those recently tested are a few varieties of Stizolobium received for trial from the Office of Seed and Plant Introduction of this Department. The velvet and Lyon beans have proved to be excellent cover crops, especially as a green manure, in rotation with pineapples or on an otherwise unoccupied field. They are sometimes troublesome in groves, as they climb over the trees. During the past two years the sword bean and pigeon pea have been tested as nitrogenous manure crops and cover crops with pineapples by planting them in the pineapple beds. Both crops have a more or less injurious effect on the growth of the pines. More damage was done to the Cabezona variety than to the Red Spanish, and the pigeon peas were more injurious than the sword beans in every case. Where the sword beans had been allowed to grow during the wet season only, the injury was the least.

The cooperative fertilizer experiment with coconuts was continued. During the past year four pickings of fruit were made, the last one being 16 months after the first application of fertilizer. No beneficial effect from the fertilizer has been observed thus far.

Dynamiting for loosening the soil and facilitating drainage has been used in a number of places in Porto Rico, both in land devoted to citrus trees and to pineapples. Thus far no striking beneficial results have been observed from the use of dynamiting. Where it has been tried in old groves and in pineapple fields no improvement has been noted that can be attributed to it. It is believed that where there is a substratum that can be broken through or the charges are placed so as to afford subsoil drainage from one loosened area to another, dynamite should prove beneficial to the heavy soils, as poor subsoil drainage is one of the greatest hindrances to citrus culture in Porto Rico.

Cultural directions for vegetables and flowers, P. J. Wester (*Philippine Bur. Agr. Circ. 25 (1913), pp. 5*).—This popular circular contains general directions for the preparation and management of vegetable and flower gardens.

The fresh vegetable trade in Germany, H. Michaelis (*Arb. Deut. Landw. Gesell., No. 261 (1914), pp. 30*).—This embraces the results of a survey of the marketing problems connected with the fresh vegetable industry in Germany. The subject matter is discussed under the general headings of the development of the German fresh vegetable industry, existing organizations for the sale of vegetables, organizations for marketing vegetables in Holland, and recommendations for the improvement of trade conditions in Germany.

Suggestions for the control of injurious insects and plant diseases, G. M. Bentley (*Tennessee Sta. Bul. 106 (1914), pp. 121–148, figs. 4*).—This bulletin contains directions for the preparation and use of various insecticides and fungicides in the control of the important injurious insects and plant diseases, and also of herbicides. Attention is also called to preventive measures, such as cultivation, drainage, time of planting, rotations, and the encouragement of beneficial insects and birds.

Fungicides and insecticides for Montana, H. E. Morris and J. R. Parker (*Montana Sta. Circ. 36 (1914), pp. 207–261, figs. 4*).—This circular discusses the composition, preparation, application, and cost of the more important fungicides and insecticides adapted to Montana conditions. A spraying calendar revised from a previous circular is also included (E. S. R., 28, p. 47).

The Arkansas dilution table for lime-sulphur compound, J. L. HEWITT (*Arkansas Sta. Circ. 23 (1914), folio*).—This table contains concise data for the preparation of diluted spray mixtures of various strengths from concentrated lime-sulphur compounds.

The manuring of orchards, W. J. ALLEN (*Dept. Agr. N. S. Wales, Farmers' Bul. 79 (1914), pp. 24, figs. 15*).—A popular treatise on the manuring of orchard and small fruits.

Observations on the hybridizing of fruits, C. G. PATTEN (*Minn. Hort., 42 (1914), No. 8, pp. 297–301, pl. 1*).—A brief popular review of progress made in the hybridizing of various orchard fruits.

The orchard census (*Ann. Rpt. Missouri Bd. Hort., 7 (1913), pp. 57–440, pls. 5, figs. 118*).—This comprises an orchard census of the State of Missouri taken in 1913 under the direction of the Missouri State Board of Horticulture and includes data on orchards of 16,789 growers.

Fruit growing in New South Wales.—What to grow and where to start, W. J. ALLEN (*Dept. Agr. N. S. Wales, Farmers' Bul. 83 (1914), pp. 58*).—A popular bulletin of information relative to the fruit districts of New South Wales, varieties adapted for specific localities, cost of establishing an orchard, etc.

A study of variation in apples, J. K. SHAW (*Massachusetts Sta. Bul. 149 (1914), pp. 21–36, fig. 1*).—In continuation of previous reports (E. S. R., 26, p. 45) the results are given of a statistical study of the variation in number, size, and form of the apples borne during a period of six years on several Ben Davis and Baldwin apple trees growing in the station orchard. The influences causing such variations are also considered.

Summarizing the data as a whole, it appears that the Ben Davis trees have borne much more heavily than the Baldwins and have shown hardly any tendency to biennial bearing. Relative to tree individuality the most prolific of five Ben Davis trees yielded over 60 per cent more apples in the total for six crops than the least prolific. The Baldwins have shown even greater differences.

The upper south quarters of the Ben Davis trees have borne a few more apples than any of the other three quarters, and these apples were constantly larger than those from the other parts, while those from the opposite quarters were generally smaller. Some Ben Davis trees showed a fairly constant tendency to produce apples larger or smaller than the average, whereas others fluctuated from season to season. Only one crop of apples was sufficiently heavy in numbers to affect the size of the fruit. Some slight indications of a relationship between size and the average summer temperature were observed, but the fluctuations in temperature were not considered large enough to overcome other influences affecting size. Certain trees showed slight individuality in the amount of variability—the larger the apples the more variable the fruit. This was not true as between the different parts of the trees.

Some trees were quite constant as to form of fruit, while others were variable. There is no strong evidence that individuality in size and form is to be found in the same tree. Apples from the upper south parts of the trees which were largest were also constantly the most flattened. A fairly constant relationship was observed between the form of the apple and the temperature for a period following bloom. The cooler this period the more elongated the apple. In general the period from the sixth to the sixteenth day following full bloom coincides with the observed fluctuation in form more closely than any other.

How sod affected an apple orchard, II, F. H. HALL (*New York State Sta. Bul. 383, popular ed. (1914), pp. 3–7, fig. 1*).—A popular edition of the bulletin previously noted (E. S. R., 31, p. 337).

Breeding Rotundifolia grapes, F. C. REIMER and L. R. DETJEN (*North Carolina Sta. Tech. Bul. 10 (1914), pp. 5–47, figs. 19*).—In continuation of pre-

vious investigations dealing with the self-sterility of Rotundifolia grapes (E. S. R., 23, p. 734) the results to date are here given of breeding investigations which have been conducted with the view of determining the laws of inheritance in this species and for the purpose of securing improved varieties.

An examination of the seedlings procured in the breeding work thus far has shown that the sexes are about equally divided. Colors in Rotundifolia grapes behave as Mendelian characters. By using proper combinations seedlings of either white, red, or black can be produced. Relative to the transmission of color it was found that the Scuppernong and all other white-fruiting varieties, together with all light-colored male vines, are pure for the white color and do not carry the dark color as a recessive factor. Such varieties as Flowers, Mish, and Thomas are pure for dark colors and do not carry the white color as a recessive. Other varieties such as James, Memory, and Smith were found to be natural hybrid vines heterozygous for the black and white colors. Latham is a natural hybrid heterozygous for red and white. Many of the dark-colored vines, both male and female, growing wild were heterozygous for the colors black and white, black and red, or red and white. White is recessive to all dark colors. Black is dominant over red. The light and dark colors of the vines are correlated with similar colors in the fruits of those respective vines.

Within certain limits the average size of the fruit cluster can be enlarged by the judicious selection of very large-sized flower-clustered male vines. The actual size of the flower cluster, however, under good conditions for cross pollination does not determine the actual size of the resulting fruit cluster. Self-sterility alone is not altogether responsible for the small-sized fruit cluster. Considerable variation was observed in the seedlings procured with reference to size of berry, flavors and qualities, thickness of skin, character of pulp, and size of seed. It is believed that by proper combination of parent vines desirable seedlings can be produced. The Scuppernong grape does not readily hybridize with *Vitis æstivalis*, *V. cinerea*, nor the Herbemont, Winchell, and Niagara varieties.

A brief review of earlier attempts to improve Rotundifolia varieties is included in the bulletin.

The hybrid direct bearers in the valley of the Rhone in 1913, A. Desmoulins and V. Villard (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 35 (1914), Nos. 28, pp. 52–59; 29, pp. 81–89*).—This comprises observations for the fourteenth year (E. S. R., 27, p. 540; see also E. S. R., 30, p. 238) relative to the behavior of a large number of hybrid direct bearing grapes with special reference to their resistance to disease and drought and adaptation to various soil conditions.

Report of strawberry shipments, season, 1913 ([*Springfield, Mo.*]: *Ozark Fruit Shippers' Assoc. [1913], pp. 19*).—This comprises condensed data on the receipts and expenses of marketing 501 cars of strawberries for the season ended June 30, 1913.

Report of the assistant horticulturist, T. B. McClelland (*Porto Rico Sta. Rpt. 1913, pp. 22–25*).—A brief progress report of the station's work with coffee, cacao, vanilla, and rubber (E. S. R., 29, p. 641), including a brief statement relative to a study of coffee and cacao plantation practices in Venezuela.

Plantings of promising foreign varieties of coffee are being made of sufficient extent to serve as valuable tests. The cultural, shading, pruning, liming, and fertilizer tests are being continued. Some striking results are being observed in the fertilizer work, although no definite conclusions can be drawn at this time. In one planting trees which had received an ample allowance of stable manure gave double the yield obtained from the check plats. A good method of controlling the guamá ant which attacks the guamá tree used as shade in coffee plantations was worked out. This consists of removing and burning the

younger growth and smaller branches of the trees on which the colonies occur and then banding the trunks with tanglefoot. In this way a large part of the ants was destroyed and practically all of the large fleshy pink scale on which they feed. Though the remaining ants continued to live for a while on some of the trees, they eventually disappeared from all of those treated.

Monthly tappings are being made of 38 of the 10 to 11-year old Castilla rubber trees which run from 24½ to 40 in. in girth at 3 ft. above the base. For eight tappings the average yield per tree per tapping was a little less than 0.5 oz. of rubber. The quality of this rubber was pronounced as along with the best and toughest Castilla rubber on the market.

A study of the results of the manurial experiments with cacao conducted at the botanic station, Dominica, H. A. TEMPANY (*West Indian Bul., 14 (1914), No. 2, pp. 81–119, pls. 6*).—This comprises a review as a whole of fertilizer experiments which have been conducted during the past 11 years and have been noted from time to time (E. S. R., 30, p. 741).

Analyses are given showing the composition of the soil of the cacao plats in the original series, together with the effects of the various manurial applications on the composition of the soil. In respect to the nitrogen content the soils of certain plats, notably those which have been mulched with grass and leaves, show considerable accretions to the nitrogen content which are unaccounted for by the quantities of this constituent added in the manurial applications. It is suggested that these accretions are due to the action of free nitrogen-fixing bacteria of the Azotobacter type, since this type of organism was found in the soils of each of the plats of the original series.

Laboratory studies of changes occurring in these soils when kept in a moistened condition showed that whereas the humus content of the soils tended to diminish very rapidly the nitrogent content did not tend to fall off in the same way as a rule, while an appreciable amount of nitrification always took place. It is suggested that the ammonia formed in the early stages of ammonification may function as a base to neutralize the nitric acid produced in the latter stages of the process.

The results of a study of the soil moisture conditions obtaining on each of the plats show that none of the manurial treatments practiced has exerted any appreciable direct effect on the moisture-retaining properties of the soil.

An investigation was also made of the temperature of the soils of the plats at different hours of the day and different seasons of the year. The results show that when the plats are adequately shaded the soil temperature remains very nearly constant at the value of the air temperature during the coolest portions of the day. When adequate shading is absent, however, the soil temperature varies to a much greater extent. These results emphasize the utility of shade in young cacao orchards.

A record of the annual yields for each of the plats shows the beneficial influence of various manurial applications. The largest increases were secured by mulching and the next largest by complete manuring. A survey of the fertilizer data for the whole period indicates that under the conditions of the experiment it takes from three to five years for the trees to indicate differences derived from various forms of treatment.

In the concluding portion of the paper the relations between the annual rainfall and the yields of cacao are considered and analytical information regarding the manurial constitution of various materials used for mulching is appended.

Robusta coffee (*O Café Robusta. Sao Paulo, Brazil: Sec. Agr., Com., e Obras Pub., 1913, pp. 59, pls. 5*).—This comprises various reports presented to the

secretary of agriculture of Sao Paulo relative to the culture and exploitation of Robusta coffee in the East Indies.

Coffee in Java, C. CHALOT and R. THILLARD (*Le Café a Java. Paris, 1914, pp. 39, figs. 3*).—This comprises observations on the culture and varieties of coffee in Java based upon a survey of a number of plantations growing different species of coffee.

A kaki classification, H. H. HUME (*Jour. Heredity, 5 (1914), No. 9, pp. 400–406, figs. 6*).—In this paper the author proposes a scheme for classifying the varieties of *Diospyros kaki* based on the behavior of these varieties when pollinated. Some data are presented to show the influence of seed development on the fruit.

Lime culture in Santo Domingo, C. CHALOT and R. DESLANDES (*Culture du Citronnier a la Dominique. Paris, 1914, pp. 68, figs. 3*).—An account of the culture and exploitation of limes in Santo Domingo.

A report on a study of the tea industry on the east coast of Sumatra and in the uplands of Padang, Sumatra, C. BERNARD (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Proefstat. Thee, No. 29 (1914), pp. 95, pls. 8, figs. 3*).—This report embraces observations and data secured on an inspection trip made in 1913.

The production of vanilla in the French colonies (*Bul. Off. Colon. [France], 7 (1914), No. 77, pp. 209–249, figs. 3*).—A statistical review of vanilla production in the various colonies of France.

The coconut in the Seychelles, R. DUPONT (*Le Cocotier aux Seychelles. Paris, 1914, pp. 13*).—A discussion of the coconut industry in the Seychelles Islands with special reference to cultural operations, management of coconut plantations, and the use of fertilizers.

FORESTRY.

Forest types: Symposium (*Proc. Soc. Amer. Foresters, 8 (1913), No. 1, pp. 53–104, fig. 1*).—In this symposium the following subjects are considered: A Standard Basis for Classification, by S. T. Dana (pp. 53–60; An Analysis and Synthesis of the Term from a Geographic Standpoint, by F. G. Plummer (p. 61); Shall the Physical Conditions or the Dendrological Mixture be the Basis for Forest Typing? by T. T. Munger (pp. 62–68); Use of Forest Types in the Work of Acquiring Lands under the Weeks Law, by K. W. Woodward (pp. 69–72); Definition and Use of Forest Types, by B. Moore (pp. 73–75); Classification of Forest Types, by W. B. Greeley (pp. 76–78); What is the Proper Basis for the Classification of Forest Land into Types? by G. A. Pearson (pp. 79–84); Basis of Classification into Forest Types and Its Application to District 1, by F. H. Rockwell (pp. 85–90); Physical versus Cover Types, by D. T. Mason (pp. 91–93); Physical Factors as a Basis for Determining Forest Types, by C. R. Tillotson (pp. 94–99); and Quality Classes and Forest Types, by R. Zon (pp. 100–104).

The technique of seed testing, C. G. BATES (*Proc. Soc. Amer. Foresters, 8 (1913), No. 2, pp. 127–138*).—A discussion of methods of seed testing with special reference to their standardization among American foresters and seed dealers.

Coordination of growth studies, reconnaissance, and regulation of yield on National Forests, H. H. CHAPMAN (*Proc. Soc. Amer. Foresters, 8 (1913), No. 3, pp. 317–326*).—In this paper the author discusses methods of coordinating growth studies and reconnaissance with reference to securing data for the regulation of yield on National Forests.

The use of frustum form factors in constructing volume tables, D. BRUCE (*Proc. Soc. Amer. Foresters, 8 (1913), No. 3, pp. 278–288*).—As a result of some tests made in Idaho the author concludes that satisfactory volume tables can be made by the use of frustum form factors from a far smaller number of trees than was previously considered possible.

Some financial forest problems, W. B. BARROWS (*Proc. Soc. Amer. Foresters, 8 (1913), No. 3, pp. 362–365, fig. 1*).—The author here briefly discusses the determination of forest percentage and capital invested in forestry.

The farm wood lot, E. G. CHEYNEY and J. P. WENTLING (*New York, 1914, pp. XII+343, figs. 62*).—This work is presented as a handbook of forestry for the farmer and the student in agriculture.

The phases discussed include the significance of the forest, its place in farm management, the growth of the tree, dendrology, practical silviculture, forest protection, mensuration and utilization, by-products of the northern woodlot, the durability and preservation of woods, arboriculture and ornamental planting, history of the forest, and forest influences. The concluding chapter contains a number of tables and rules dealing with wood, lumber, and tree growth.

The management of second-growth hardwoods in Vermont, A. F. HAWES and B. A. CHANDLER (*Vermont Sta. Bul. 176 (1914), pp. 31–86, pls. 12*).—A practical treatise on the management of second-growth hardwoods based largely on a study of various woodland areas in Vermont. The successive parts of the bulletin discuss estimating the contents of a woodlot, improvement of the stand, yield tables, crop maturity and the selection of the crop, market conditions, and enemies of northern hardwoods. Volume tables to be used in estimating timber of various species are appended.

Studies in tolerance of New England forest trees.—I, Development of white pine seedlings in nursery beds, G. P. BURNS (*Vermont Sta. Bul. 178 (1914), pp. 127–144, pls. 4, figs. 2*).—This bulletin reports a study of seed bed practices in the forest nursery with special reference to the development of pine seedlings.

The experiments conducted at the station indicate that damping-off of white pine seedlings can be controlled by the use of formaldehyde or sulphuric acid. A series of trials was made to determine the proper depth for planting seed, and the results indicate that in sandy soil seed should be planted not less than ½ in. deep. When the seed is sown early in wet weather no top shade is needed to get an even stand. When sown late in dry weather, however, the surface soil must be kept moist by watering or by full shade top. A study of the effect of lath shade on germination showed that shade reduces the temperature and delays the time of germination. After the period of germination all shade should be removed because it hinders the development of the seedling. The seed beds should be provided with solid sides during the first season, as the sides greatly decrease the loss of water by transpiration.

A brief bibliography of consulted literature is appended.

Experimental forest planting in the Hawaiian Islands, R. S. HOSMER (*Proc. Soc. Amer. Foresters, 8 (1913), No. 2, pp. 211–221*).—A general account of forest conditions in Hawaii including progress made in experimental forest planting.

The tree species of Java: Contribution No. 13, S. H. KOORDERS and T. VALETON (*Meded. Dept. Landb. [Dutch East Indies], No. 18 (1914), pp. VII+286*).—This is the thirteenth of a series of reports on the tree species of Java (E. S. R., 25, p. 142). In the present report the genera and species of Aquifoliaceæ, Convolvulaceæ, and Thymelæaceæ are taken up by T. Valeton; and of Violaceæ, Moraceæ, Hamamelidaceæ, Clethraceæ, and Ericaceæ by J. J. Smith.

A table of contents and an index to the series as a whole are included.

Lumbering industry of the Philippines, J. R. ARNOLD (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Spec. Agents Ser., No. 88 (1914), pp. 22*).—This report reviews briefly the forest resources of the Philippines, the degree to which they are being exploited, the prospects for increased activity in lumbering, the kind of machinery now used, and the selling methods usually followed.

Progress report on forest administration in the Northwest Frontier Province for 1912–13, M. R. K. JERRAM (*Rpt. Forest Admin. Northwest Frontier Prov., 1912–13, pp. 3+II+15+XXVI*).—This is the customary progress report relative to the administration of the state forests, including a financial statement for the year 1912–13. All important data relative to forest areas, surveys, working plans, protection, and miscellaneous work, silvicultural operations, yields, revenues, etc., are appended in tabular form.

DISEASES OF PLANTS.

Notes on plant diseases of Connecticut, G. P. CLINTON (*Connecticut State Sta. Rpt. 1914, pt. 1, pp. 1–29, pls. 7*).—After giving a discussion of the relation of weather conditions to the diseases prevalent during the year, the author describes a number of diseases which are either new to the State or not previously reported upon the host plants given.

Among these are fasciation, frost bands, syncarpy, and water core of apple, heart rot of celery (*Bacillus carotovorus*), corn mold (*Cephalothecium roseum*), Shasta daisy leaf spot (*Septoria leucanthemi*), rust of Chinese juniper (*Gymnosporangium haraanum*), arsenical burn of Lima beans, oil injury to hard maple, parsnip soft rot (*B. carotovorus*), scrub pine rust (*Peridermium comptoniæ*), poplar crown gall (*Bacterium tumefaciens*), potato blackleg (*Bacillus phytophthorus*), privet anthracnose (*Glomerella cingulata*), Sclerotium disease of redtop (*S. rhizodes*), mechanical spotting of rose (*Pilobolus crystallinus*), salsify soft rot (*B. carotovorus*), phyllodiniation or string leaves of tobacco, and orange leaf rust of wheat (*Puccinia triticina*).

Report of the imperial mycologist, E. J. BUTLER (*Rpt. Agr. Research Inst. and Col. Pusa [India], 1912–13, pp. 55–69*).—Besides other information this report deals with a wide range of studies on diseases of plants, among which may be noted ufra, eelworms, bunt, false smut, and gwa-bo (probably due in part to *Sclerotium oryzæ*) of rice; red rot and three minor diseases, not yet determined as to cause, of sugar cane; Colocasia blight and potato blight; poppy blight (caused by *Peronospora arborescens*); orange and yellow rust of wheat; a fungus disease of peanuts; cotton and sesame wilts; anthracnose of sisal hemp (due to *Colletotrichum agaves*); indigo diseases (thought to be of other than fungal origin); some phanerogamic parasites; and other miscellaneous plant troubles and investigations.

A species of Rhizophidium parasitic on the oospores of various Peronosporaceæ, I. E. MELHUS (*Phytopathology, 4 (1914), No. 2, pp. 55–62, pl. 1*).—In conducting some studies on oospore germination the author encountered considerable difficulty on account of the presence of the parasite *R. pollinis*. Attempts were made to germinate the oospores of *Cystopus bliti* from leaves, stems, and flowers of *Amaranthus retroflexus*, but many of them were destroyed by the parasitic organism. Subsequently the oospores of *C. candidus* and *C. cubicus* were exposed to infection by transferring infected oospores of *C. bliti*, and infection resulted in ten days. In a similar way the oospores of *Peronospora effusa* and *Sclerospora graminicola* showed the infection after six days.

Later experiments were carried on with pollen from the hyacinth and the calla lily, which showed that the pollen also was parasitized by *R. pollinis*.

Heterodera radicicola attacking the Canada thistle, L. E. MELCHERS (*Science, n. ser., 40 (1914), No. 1024, p. 24*).—The author notes the occurrence, on the roots of the Canada thistle, of the nematode *H. radicicola*, thus adding another host plant to the long list already known.

Spore germinations of cereal smuts, E. C. STAKMAN (*Minnesota Sta. Bul. 133 (1913), pp. 52, pls. 25*).—This is a technical bulletin in which the author gives results of observations on the germination of spores of *Ustilago tritici*, *U. nuda*, *U. hordei*, *U. avenæ*, *U. zeæ*, and *Tilletia fœtens*.

These smuts are found to fall into two classes as far as germination is concerned, *U. nuda* and *U. tritici* producing no sporidia, while the others produce sporidia. The period of germination was found to vary considerably in different forms, *U. hordei* germinating most readily, only 6½ hours being required in some cases, while *T. fœtens* required the longest time, the minimum for germination of these spores being 48 hours. The germination characteristics are said to be quite closely connected with the life history of the parasite, those forms which live over in the seed producing no sporidia, while those which live over in the soil or on the kernels produce sporidia which help to insure their chances of persistence. Differences are also noted in the behavior of the promycelium of the different species. The spores of all forms were exposed to winter conditions in Minnesota and all germinated readily in the spring, demonstrating that smuts may survive the winter in the spore form under field conditions.

A bibliography of the subject is given.

Studies on club root.—I, The relation of Plasmodiophora brassicæ to its host and the structure and growth of its plasmodium, B. F. LUTMAN (*Vermont Sta. Bul. 175 (1913), pp. 27, pls. 4, figs. 6*).—The results of a study of the relation of the fungus causing the club root of various cruciferous plants to the host plant is given, together with a summary of earlier work.

It is stated that the parasite enters the host either through the epidermis or root hairs, and once within the plant it spreads from cell to cell, either through penetrating the cell walls or through host cell divisions. It is found present in the cortex, but sometimes the organism makes its way into the cells of the central cylinder. The infected host cells become hypertrophied, but nuclear and cell division is not seriously interfered with in the earlier stages. In advanced cases both processes are entirely suspended and the nucleus undergoes degeneration. The plasmodium of the fungus is said to be clear and almost transparent at first and is distinguished with difficulty from the protoplasm of the host. The nuclear divisions in the plasmodium are both vegetative and reduction. In the study reported most of the material was taken from cabbage plants.

A brief bibliography is appended.

Occurrence of bacterial blight of alfalfa in the Salt Lake Valley, Utah, P. J. O'GARA (*Science, n. ser., 39 (1914), No. 1016, pp. 905, 906*).—The author reports the occurrence of the bacterial blight of alfalfa, due to *Pseudomonas medicaginis*, in Utah, and he states that the alfalfa weevil is a factor in the distribution of the disease. It is said that the disease sometimes destroys 80 per cent of the first cutting of alfalfa, and while the chief damage is usually done at the first cutting, the plants may be so seriously injured in the crown and roots as ultimately to cause their death.

The cob rot of corn, E. G. ARZBERGER (*Ohio Sta. Bul. 265 (1913), pp. 69–82*).—Attention was called in 1911 to a disease of corn in which the cob of the ear was infected by a fungus. This appeared abundantly in 1911 and again in 1912, and an investigation was undertaken to determine whether the fungus, *Coniosporium zeæ*, was parasitic or only present as a saprophyte.

A large number of inoculation experiments were made and field observations taken, which indicate that *C. gecevi* develops and acts as an obligate saprophyte, and can not, therefore, be considered as the cause of the disease. Inoculations with an unknown fungus, or possibly with several fungi, produced good infections resulting in diseased ears, but these are to be the subject of further study. It is considered that *C. gecevi* is of economic significance only in that it destroys the cob tissue as a saprophyte, and that its effect on the kernels is rather limited when compared with the injury caused by Diplodia, Fusarium, and other fungi.

Hot water treatment for cotton anthracnose, H. W. BARRE and W. B. AULL (*Science, n. ser., 40 (1914), No. 1020, pp. 109, 110*).—A preliminary report is given of experiments to test the effect of hot water at different temperatures on the anthracnose fungus and on cotton seed, the object being to determine whether the fungus could be killed without injury to the seed.

As a result of the test it was found that cotton seed can remain at 70° C. for 15 minutes without injury to germination. This temperature seems to be destructive to the fungus, as seed so treated has been germinated free from disease, while an average of 22 per cent of the seedlings in the checks from the same lot of seed were diseased.

Two fields of cotton on the Clemson College farm have been planted with seed so treated and are under observation to determine the ultimate effect of the treatment.

Disease resistance of potatoes, W. STUART (*Vermont Sta. Bul. 179 (1914), pp. 147–183, pls. 4, figs. 7*).—In continuation of previous reports on investigations carried on at the Vermont Station on disease resistance of potatoes (E. S. R., 17, p. 1078), the author gives a final account of his investigations on varietal resistance of potatoes to the attacks of the early blight (*Alternaria solani*), late blight (*Phytophthora infestans*), and the scab (*Oospora scabies*).

Tests of a large number of varieties of potatoes of American and European origin have been conducted. The varieties which showed the greatest resistance or freedom from early blight were, with few exceptions, of foreign origin. The resistant foreign varieties were almost without exception of little commercial value, as they were usually light yielders and rather poor in quality. The author considers the value of disease resistance in potatoes as rather problematical, but suggests that by crossing some of the resistant European varieties with the more desirable commercial American types some resistant varieties of commercial value might possibly be obtained.

In testing different varieties for resistance to scab none were found to show markedly resistant qualities when grown on soil well infested with the scab organism. The commonly prevalent idea that russet-skinned varieties do not become scabby was found not to be based on fact, as one of the pronounced russet varieties was very low in the scale of resistance. Some varieties are said to have been found somewhat less subject to scab than others, but it has been impossible to determine whether or not this immunity is inherent. The author believes there is little hope of securing scab-resistant varieties through selection.

Notes are given on the growing of seedling potatoes, desirable types of potatoes, and varietal response to Bordeaux mixture. Under the last head the author states that some varieties respond better to spraying than others, and that heat, moisture, and sunshine modify the outcome when Bordeaux mixture is used. The beneficial effect of Bordeaux mixture is attributed to diminished transpiration, the maintenance of optimum light intensity, and the lengthening of the season of growth.

Discussing the value of foreign varieties of potatoes introduced into this country, it is stated that very few have proved satisfactory. For the most part those which have come under the author's observation have produced tubers of inferior table quality, although some were highly resistant to disease. It appears that high disease resistance of the vine was correlated with a low and undesirable tuber yield.

Chlorosis of sugar cane, P. L. GILE and C. N. AGETON (*Porto Rico Sta. Rpt. 1913, pp. 13, 14*).—A brief report is given of investigations on the occurrence and cause of chlorosis of sugar cane.

Two crops of chlorotic cane have been under observation, and the authors state that there did not appear to be any definite period when it became diseased. As a rule ratoon cane seems to be affected more severely and generally earlier than plant cane. In some cases the appearance of the diseased cane was much improved after a rainy period, while in others new leaves appearing directly after the rain were strongly chlorotic.

The areas of chlorotic cane so far have been confined to strongly calcareous soils, although all cane grown on calcareous soils is not affected. Some small areas are known that have been planted year after year that always produce chlorotic cane and many of these are on the slopes of limestone hills.

Tomato diseases, J. L. HEWITT (*Arkansas Sta. Circ. 21 (1914), pp. 4*).—Popular descriptions are given of the late blight, black rust, fungus wilt, bacterial wilt, blossom end rot, and root knot of tomatoes, with suggestions for their control.

Some important diseases of tomato in North Carolina, H. R. FULTON (*North Carolina Sta. Circ. 19 (1914), pp. 8*).—This publication is designed to give information regarding tomato diseases for the benefit of members of tomato clubs which have been formed throughout the State. Brief descriptions are given of the more common diseases, with suggestions for their control, which include the proper selection of seed and cultivation of plants, together with spraying where this method of treatment is known to offer protection.

Two tomato diseases (*Agr. News [Barbados], 13 (1914), No. 315, p. 174*).—Descriptions are given of the leaf mold due to *Cladosporium fulvum* and the blossom end rot of tomatoes, which is considered due to bacteria.

For the first disease, where conditions are favorable for the development of the fungus the author recommends spraying at frequent intervals with a 4:4:50 Bordeaux mixture. For the second disease it is said that attention to the water supply and preventing excessive transpiration will reduce the amount of disease present.

Fruit diseases in Montana, D. B. SWINGLE (*Montana Sta. Circ. 37 (1914), pp. 263–330, pl. 1, figs. 21*).—The purpose of this publication is to give fruit growers of the State information to aid them in combating the diseases in their orchards. After a general discussion of fruit diseases and methods of combating them, the author describes the apple blight, crown gall, scab, Baldwin spot, and Jonathan spot; pear blight, crown gall, and scab; peach leaf curl and crown gall; gooseberry mildew; raspberry and blackberry crown gall; and strawberry leaf spot, with specific directions for combating the different diseases.

The blight of apples, pears, and quinces, B. S. PICKETT (*Illinois Sta. Circ. 172 (1914), pp. 10, figs. 4*).—A description is given of the blight of apples, pears, and quinces due to *Bacillus amylovorus*, the author stating that this disease severely attacks not only these, but a number of other plants belonging to the same family.

The symptoms of the disease are popularly described and suggestions given for preventive and remedial measures to be adopted against it. These consist

largely of the removal of the infective sources which carry the disease over winter.

A contribution to our knowledge of apple scab, H. E. MORRIS (*Montana Sta. Bul. 96 (1914), pp. 65–102, pl. 1, figs. 3*).—The author gives an account of the apple scab, due to *Venturia inæqualis*, in Montana, tracing the history of its appearance and giving data regarding the amount of injury done, periods of infection, etc. The question of the identity of *V. inæqualis* on the apple and *V. pirina* on the pear is discussed, and the author is inclined to believe that the species are not identical.

Notes are given on methods of control, in which the author recommends the planting of resistant varieties and thorough spraying. Lists are given of different varieties of apples commonly planted in Montana, arranged according to their resistance.

A bibliography of 505 references is given.

A destructive strawberry disease, F. L. STEVENS (*Science, n. ser., 39 (1914), No. 1017, pp. 949, 950*).—Attention is called to the fact that long-distance strawberry shipments during the past season have suffered serious injury due to molds or "leaks," the loss in some cases being very large.

The berries subject to this trouble came largely from Louisiana and Mississippi. The author, early in May, examined in Louisiana berries which had been in the refrigerators over night, and found in many instances that boxes showed fruit with small rotten spots. Visits to the field showed many berries rotting on the vines. Examination of the material showed the presence of a Botrytis, probably *B. cinerea*. In the later stages other fungi were present, notably *Rhizopus nigricans*. Examination made of a large number of berries showed almost uniformly the presence of Botrytis, and its predominance led the author to believe that it is the primary cause of the trouble. The Botrytis is thought to initiate the decay, which is completed by other saprophytes, among them Rhizopus. Both fungi have been separated in pure cultures and are to be subjected to further study.

The presence of endocellular fibers in tissues of grapevines and in those of other dicotyledons, EVA MAMELI (*Atti R. Ist. Bot. Univ. Pavia, 2. ser., 16 (1914), pp. 47–65, pl. 1*).—This is a fuller account of studies previously noted from another source (E. S. R., 29, p. 551).

Report of the plant pathologist, G. L. FAWCETT (*Porto Rico Sta. Rpt. 1913, pp. 26–29*).—A progress report is given of the work carried on by the author in his study of the diseases of cacao, citrus trees, and coffee.

The cacao disease reported upon at length is that known as black pod in Porto Rico, but which is said to be distinct from the disease generally known by that name. It is confined to young fruits, and the loss apparently is very great, as on many trees not more than 5 per cent of the fruits reach maturity. In order to find what relation there might be between fungi and bacteria and the failure of pods to mature, the author made cultures from the interior tissues of a large number of fruits, and occasionally found some fungi, among them a fungus which agrees fairly well with the description of *Colletotrichum cradwickii*. Inoculation experiments were conducted with the different fungi, but with the exception of the Colletotrichum, which proved weakly parasitic, the author concludes that the work would indicate that the trouble is not due to parasitic fungi. Spraying experiments with Bordeaux mixture were carried on for two seasons, but without any very definite beneficial results. The effect of fertilizers on the tree is also being considered in connection with this disease. Thus far the fungus *Phytophthora faberi* has not been found in Porto Rico.

The study of citrus diseases has been largely confined to the lemon scab. The fungus producing this disease has been found to attack grapefruit while

small, producing wart-like outgrowths and seriously reducing their market value. The disease is said to be very common, and a study has been made of various host plants harboring species of Cladosporium. On the gandul or pigeon pea a species of Cladosporium was found present which inoculated upon young grapefruit produced warty outgrowths, and young lemon plants similarly inoculated developed scab identical in appearance with that caused on lemon leaves by *C. citri*. The pigeon pea is used to a considerable extent as a cover crop, and should it prove a host for the citrus fungus its further employment in this way should be abandoned.

The coffee disease reported upon is that caused by *Cercospora coffeicola*, which hitherto has been considered simply a leaf parasite, but the author has found that it also is responsible for a considerable proportion of bad grains of coffee.

Rot of orange trees in Francofonte, and its treatment, L. SAVASTANO (*R. Staz. Sper. Agrum. e Frutticol. Acireale, Bol. 9 (1912), pp. 8*).—Continuing the work previously noted (E. S. R., 23, p. 149), the author here deals more particularly with diseases of citrus fruits as affected by local conditions, and states that modifications of cultural methods employed and timely tree surgery or substitution of sound young trees have been followed by good results.

The hereditary transmission of rust in mallows, L. BLARINGHEM (*Compt. Rend. Acad. Sci. [Paris], 157 (1913), No. 26, pp. 1536–1538*).—Referring to the claim previously made (E. S. R., 30, p. 453) that in the association of *Althæa rosea* and *Puccinia malvacearum* the host is favored by abundance and the parasite by lack of water in the tissues, the author states that later experimentation described shows that the addition of 5 per cent of saccharose or glucose to the nutritive solution is followed by a development of rust pustules as the medium dries out, whereas under other conditions no such development is noted.

A disease of Narcissus bulbs, G. MASSEE (*Jour. Bd. Agr. [London], 20 (1914), No. 12, pp. 1091–1093, pl. 1*).—The author describes an injury to Narcissus bulbs ascribed to *Fusarium bulbigenum*, known since 1887 but not until recently recognized as parasitic.

Very young leaves of Narcissus, about 1 in. long, were inoculated, developing characteristic disease spots in about six days, and others as growth proceeded. It is thought that the process is advanced by secondary as well as primary infection. It is held that soaking slightly diseased bulbs in a fungicide will not kill the mycelium in the bulbs or the resting spores, but that during germination the secondary spores may be destroyed by a dressing of kainit or of potassium sulphate worked into the soil. Rotation with nonsusceptible plants is also recommended.

The technique of operation for rot and gummosis of trees, L. SAVASTANO (*R. Staz. Sper. Agrum. e Frutticol. Acireale, Bol. 8 (1912), pp. 15, figs. 11*).—The author deals briefly with typical operations employed in tree surgery as regards roots and trunks and instruments adapted to the same.

Notes on diseases of trees in the southern Appalachians, III, A. H. GRAVES (*Phytopathology, 4 (1914), No. 2, pp. 63–72, pl. 1, figs. 10*).—In this paper the author gives an account of diseases of the spruce and hemlock, thus concluding a series of papers noted elsewhere (E. S. R., 31, p. 348).

The diseases of spruce described are blight of seedlings, due to *Ascochyta piniperda, Sclerotinia fuckeliana*, and *Phoma* sp.; twig blight, due to *Pestalozzia* sp. and *Phoma piccana;* heart rot, caused by *Trametes pini;* and frost injury. Among the diseases of hemlock, descriptions are given of the timber rot, due to *Fomes pinicola;* leaf rust, caused by *Pucciniastrum myrtilli;* and twig blight, which is attributed to *Roselinia* sp.

New facts concerning the white pine blister rust, P. SPAULDING (*U. S. Dept. Agr. Bul. 116 (1914), pp. 8*).—In a previous publication (E. S. R., 29, p. 554), the author presented information regarding the white pine blister rust up to 1913. In the present publication additional information is given based on extensive investigations conducted during the summer and fall of 1913. This includes an account of the work with infested white pine trees near Geneva, N. Y., new outbreaks in northern Vermont, near Ipswich, Mass., and near Meriden, Conn., observations on the wintering-over of the disease on Ribes, *Pinus excelsa* as a host, spore distribution of *Cronartium ribicola*, and a tabular account of the general results of inspections.

The damping-off of coniferous seedlings, P. SPAULDING (*Phytopathology, 4 (1914), No. 2, pp. 73–88, pl. 1, figs. 2*).—On account of the seriousness of damping-off of coniferous seedlings, the author has made a study of methods of control, particularly that of soil sterilization.

The damping-off of coniferous seedlings is due to a number of organisms, among them Fusarium, Pythium, and Rhizoctonia. In the experiments reported, tests were made of a number of fungicides for soil treatment as well as modifications of nursery methods. The experimental work indicates that soil sterilization sufficient to prevent damping-off is effectively accomplished with formalin (1 oz. to 1 gal. water, or stronger), sulphuric acid (1 oz. to 1 gal. water, or stronger), and rather dilute ammonium copper carbonate. These chemicals should be applied before seedling, as no chemical was found that was effective in stopping outbreaks of the disease after germination. Weak formalin applied after germination of seeds was found worse than useless, as it destroyed many of the young plants. The quality of the seed was found to have something to do with damping-off, as light weight, poorly filled seed produced weak seedlings, which were longer in germinating and were very subject to this disease.

A bibliography of the subject is appended.

Preliminary tests of disinfectants in controlling damping-off in various nursery soils, C. HARTLEY and T. C. MERRILL (*Phytopathology, 4 (1914), No. 2, pp. 89–92*).—The results are given of cooperative experiments for the control of damping-off of pine seedlings, caused mainly by *Pythium debaryanum* and *Fusarium* sp. In the experiments copper sulphate, zinc chlorid, formalin, and sulphuric, nitric, and hydrochloric acids have been tested.

So far the best results on most soils have been secured with sulphuric acid. This has proved more successful than heat, where both have been tested, and it also protects the soil against reinfection. In an experiment in which air-slaked lime was applied following the acid disinfection, the treatment seemed to be successful without injury to the plant, but it allowed reinfection. For soils on which sulphuric acid is not an efficient disinfectant, zinc chlorid and copper sulphate seemed to possess greater efficiency than formalin.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Revision of the American harvest mice (genus Reithrodontomys), A. H. HOWELL (*U. S. Dept. Agr., Bur. Biol. Survey, North American Fauna No. 36 (1914), pp. 94, pls. 7, figs. 6*).—In this revision the author recognizes 58 species and subspecies as belonging to the genus Reithrodontomys, of which seven are described as new.

The American harvest mice are said to occur abundantly in or near meadows and cultivated lands over a large part of the United States. While their exact economic relation is still little known they belong to a group of mammals

many species of which are injurious to agriculture, and there is no doubt that they consume large quantities of forage and some grain.

Maps showing the range of the more important species accompany the account.

Birds and their value to the agriculturist with some notes concerning insects, P. L. GUPPY (*Bul. Dept. Agr. Trinidad and Tobago, 13 (1914), Nos. 79, pp. 116–128; 80, pp. 148–156, pls. 4*).—This article includes lists of birds frequenting cacao fields and of those useful to sugar planters.

First report on the economic features of the amphibians of Pennsylvania, H. A. SURFACE (*Bi-Mo. Zool. Bul. Penn. Dept. Agr., 3 (1913), No. 3–4, pp. 67–152, pls. 10, figs. 25*).—This paper deals with the mud puppy, salamanders, toads, and frogs known to occur in Pennsylvania, their habits, hibernation, reproduction, enemies, food, and economy. The author takes up the collecting and preserving of specimens, the classification, gives a key to the orders of Pennsylvania Amphibia, and a color key to the salamanders of the State, reports upon the stomach contents of Pennsylvania amphibians and popular errors concerning them, and defines the terms used. A bibliography of 19 titles and an index are included.

The investigations show that none of the amphibians of Pennsylvania are injurious or harmful in any way but that on the other hand they are often very useful destroyers of insect pests, snails, and slugs, and some are valuable because of their edible flesh. Others are of value as bait for fish and as food for fish and birds.

Bibliography of Canadian zoology for 1912, L. M. LAMBE (*Proc. and Trans. Roy. Soc. Canada, 3. ser., 7 (1913), Sect. IV, pp. 187–199*).—This annotated list covers the literature exclusive of entomology.

Bibliography of Canadian entomology for 1912, C. G. HEWITT (*Proc. and Trans. Roy. Soc. Canada, 3. ser., 7 (1913), Sect. IV, pp. 161–173*).—One hundred and twenty-one titles are listed in this annotated bibliography.

Eleventh annual report of the state entomologist of Montana, R. A. COOLEY (*Montana Sta. Bul. 98 (1914), pp. 121–136, fig. 1*).—This report consists of concise accounts of the occurrence of the more important pests in Montana during 1913, with the texts of the state laws relating to plant quarantine and the establishment of a state board of entomology.

Insect pests in 1912, R. S. MACDOUGALL (*Trans. Highland and Agr. Soc. Scot., 5. ser., 25 (1913), pp. 192–208, figs. 9*).—This is the author's annual report on the occurrence of the more important insect pests during the year and continues previous work (E. S. R., 27, p. 552).

Insect pests in 1913, R. S. MACDOUGALL (*Trans. Highland and Agr. Soc. Scot., 5. ser., 26 (1914), pp. 170–187, figs. 15*).—The author's annual report on the occurrence of the more important insect pests, in continuation of that above noted.

The principal insect pests of field crops in European Russia for the last twenty years, N. M. KULAGIN (*Ezheg. Dept. Zeml. [Russia], 1913, pp. 585–638, pl. 1; abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 4, pp. 201, 202*).—The author reviews in this article the appearance and distribution of and damage done by the principal insect enemies of field crops for the past 20 years in Russia, together with the more important measures for combating them.

List of pests of alfalfa, E. M. VASSILIEV (*Khozĭaistvo, No. 16–17 (1913), pp. 8; abs. in Rev. Appl. Ent., 1 (1913), Ser. A, No. 12, pp. 526, 527*).—A list of pests arranged by orders.

First supplement to the list of animal pests of alfalfa, E. M. VASSILIEV (*Khozĭaistvo, No. 6 (1914), pp. 189–193; abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 4, pp. 262, 263*).—This lists additional enemies of alfalfa and supplements that noted above.

The imported cabbage worm and the cabbage aphis. J. R. PARKER (*Montana Sta. Circ. 28 (1913), pp. 9–24, figs. 12*).—This circular consists of a general account of these pests and means for their control.

African cotton pests. F. ZACHER (*Arb. K. Biol. Anst. Land. u. Forstw., 9 (1913), No. 1, pp. 121–230, figs. 83; abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 1, pp. 1, 2*).—The insect enemies of cotton in Africa and remedial measures are described at considerable length.

Insect enemies of lettuce. P. NOEL (*Bul. Lab. Régional Ent. Agr. [Rouen], No. 4 (1913), pp. 4–6*).—The author lists 50 enemies of lettuce.

Animal enemies of the sugar beet in 1913. A. STIFT (*Bl. Zuckerrübenbau, 21 (1914), Nos. 4, pp. 60–64; 5, pp. 72–73*).—This is a summarized account with references to the literature of the year.

Tree crickets injurious to orchard and garden fruits. P. J. PARROTT and B. B. FULTON (*New York State Sta. Bul. 388 (1914), pp. 417–641, pls. 10, figs. 9*).—This is a detailed report of studies, data relating to which have been previously noted (E. S. R., 29, p. 354).

It is stated that the more common and injurious species of tree crickets in plantings of garden and tree fruits in New York are the snowy tree cricket (*Œcanthus niveus*), the narrow-winged tree cricket (*O. angustipennis*), and the striped tree cricket (*O. nigricornis*). While these species display great similarity in external appearance, they show marked differences in habits and economic status. During their early nymphal existence they possess pronounced predaceous habits, but as they approach maturity they exhibit phytophagous and mycophagous tendencies, subsisting on floral organs, foliage, fruit, and minute fungi. The eggs are deposited during the latter part of August and throughout September and hatch during early June; 5 nymphal instars are passed and the adults make their appearance in August.

The snowy tree cricket oviposits in a great variety of plants, most abundantly in the apple, plum, and cherry, and somewhat commonly in raspberry and walnut. The eggs are deposited singly in soft, fleshy bark. On the raspberry oviposition takes place in the fleshy area at the side of the bud in the axils of the leaves, and usually there is not more than one egg on each side of a bud. Microscopical examinations of the crop contents have shown that the San José scale may, under certain conditions, form a large part of the diet of this cricket. It has also been observed to eat holes in raspberry and apple leaves and is reputed to attack ripening fruits. It derives its reputation as an orchard pest chiefly from the occurrence of diseased areas about wounds in the bark of apple trees. The areas of infection in their external appearance and effects resemble superficially certain stages of the common apple cankers. Cultural and microscopical studies indicate that in 1913 a fungus (*Leptosphæria coniothyrium*) was in a majority of cases the infecting organism.

The narrow-winged tree cricket has feeding habits similar to the snowy tree cricket. It is said to be common in apple orchards and has been observed in considerable numbers on alders and scrub and bur oaks. As with *O. niveus* various disorders of bark may attend oviposition in apple trees.

The striped tree cricket, unlike the other two, prefers plants which have a central pith surrounded by a woody outer layer in which to oviposit. Oviposition occurs in many plants, but the eggs are deposited most abundantly in the raspberry and blackberry, *Erigeron canadensis*, and the larger species of Solidago. The eggs are placed in a series, forming a single row in the current year's growth, and with raspberries have ranged in number from 2 to 80 or more eggs in a row. It feeds on anthers and petals of flowers, raspberry leaves, and fruit. Leaf tissues, fungus mycelium, and spores constituted a large part of the crop contents of a number of specimens that were examined.

It has attained its standing as a destructive pest because of its injurious work on the raspberry and blackberry. The injuries arise from the long series of punctures which it produces in canes during the process of egg laying. As a result of the rupturing of woody tissues the cane splits at the point of injury and becomes so weakened that it eventually breaks down from the weight of the upper growth or from twisting by the wind.

These tree crickets have a number of natural enemies, the more common and efficient being egg parasites of which there are 8 species. These include 3 chalcidoids and 5 species of proctotrupoids, namely, *Macroteleya œcanthi*, *Anastatus* (*Antigaster*) *mirabilis*, *Polynema bifasciatipenne*, Teleas (?), *Calo-teleia* sp., *Baryconus œcanthi*, *Cacus œcanthi*, and *Idris* sp. Of the three species discussed *O. nigricornis* appears to be the most subject to parasitism.

In regard to preventive and remedial measures it is stated that cultivation to destroy foreign vegetation, as weeds and brush, about and in plantings of fruit, and to keep the ground about trees and vines clean is an efficient measure for the prevention of damage. While the susceptibility of these insects to arsenicals has not been conclusively demonstrated it is believed that the numbers of the tree crickets are reduced by summer applications of these poisons. Raspberry canes showing extensive oviposition should be removed in the course of winter and spring pruning and burned to destroy the eggs contained in them.

Tree crickets of garden and orchard, F. H. HALL (*New York State Sta. Bul. 388, popular ed. (1914), pp. 8, pls. 4, figs. 3*).—A popular edition of the above.

The Acridiidæ of Minnesota, M. P. SOMES (*Minnesota Sta. Bul. 141 (1914), pp. 7–100, pls. 4, figs. 11*).—A synopsis of this order, with tables for the separation of the forms described as occurring in Minnesota. A brief bibliography is appended.

The tarnished plant bug (Lygus pratensis), C. R. CROSBY and M. D. LEONARD (*New York Cornell Sta. Bul. 346 (1914), pp. 463–526, pls. 6, figs. 9*).—This summarized account of the present knowledge of *L. pratensis* includes the results of observations and experiments commenced by the authors in 1911. Some 50 plants are mentioned as being injured by this plant bug.

In New York as a rule the pest hibernates in the adult stage. Oviposition was observed on August 10, 1898, by Slingerland, who found about 10 days to be required for the incubation of the egg. Five nymphal stages are described and illustrated. It is stated that Haseman (E. S. R., 29, p. 354) has found 25 to 30 days to be required in September and October for the completion of the life cycle, thus indicating that there are four or five annual generations. The insect has but few natural enemies. The eggs, however, are destroyed to a slight extent by the minute mymarid parasite *Anagrus orientatus*.

The greatest injury by this insect appears to be caused to peach nursery stock. Nursery stock thus attacked presents a dwarfed and bushy appearance, due to the killing of the terminal buds of both the laterals and the main shoot by the feeding punctures of the adults in late June and early July. Observations which extended over the last two years show that only a very few tarnished plant bugs are to be found in the peach blocks before the latter part of June. In 1912 and again in 1913 about June 23 they suddenly increased in numbers and within a week became extremely abundant. The injury to the buds followed closely after the increase in the number of the insects. When the tip has been punctured the leaves wilt, turn brown, and die; the bud also is killed and further growth of the plant is prevented.

While this injury to peach nursery stock, known as peach stop-back, has been ascribed to other causes experiments have shown that it is produced by the tarnished plant bug. The fact that the injury may be produced by nymphs, as

experiments show, would indicate that it is caused by feeding punctures. The fact that injury was not produced by needle punctures would suggest that in feeding the insect injects some substance poisonous to plant tissue.

The losses occasioned to peach nursery stock are very great. The trees are stunted and bushy and do not have a strong leader and must therefore be sold as second or third class stock. It is stated that while these trees do not have proper form nevertheless they are perfectly thrifty and in many cases are as good for planting as those having a large, fully developed leader, if not better.

Control measures are discussed at length. It is stated, however, that the control of this plant bug is still an unsolved problem. Most of the remedies suggested are either inadequate to meet the demands of practical growers, unsuited to the conditions under which the crop is grown, or impracticable in other ways.

An extensive bibliography is appended.

Susceptibility to spraying mixtures of hibernating pear psylla adults and their eggs, H. E. Hodgkiss (*New York State Sta. Bul. 387 (1914), pp. 389–418, pls. 3, figs. 2*).—Investigations of failures to control the psylla in pear orchards led the station to inquire into the susceptibilities of hibernating adults and their eggs to spray mixtures.

Studies of its seasonal history and habits have shown that the pear psylla passes the winter as an adult and that it deposits its eggs in the spring within a short period after its emergence from hibernating quarters. It was observed to winter over on various fruit trees, such as apple, cherry, plum, and peach, but the largest number was found to hibernate in the rough bark of the pear tree. When mild weather prevailed the eggs were found to be largely deposited within a few days after the emergence of the hibernating adults in the spring. Oviposition continued for several weeks, especially if the weather was variable, but usually most of the eggs were deposited before the last of April. Some of the eggs were deposited on foliage, but it appeared that these normally are comparatively few in numbers and result in little or no serious infestation of the foliage.

The practice of clean culture and removal and destruction of the rough bark left the psylla with few opportunities of escape from application of contact mixtures. "Miscible oils, nicotin preparations, and soapy solutions were effective sprays against the psylla adults. Homemade oil emulsions were less satisfactory, which may have been owing to varying percentages of oil in the mixtures, caused by imperfectly prepared emulsions.

"The best means of killing the flies is spraying during a period of warm weather, preferably in November or December, or during March or early in April. The most satisfactory mixture, from the standpoints of safety to fruit and leaf buds and effectiveness against the insect, is 0.75 pt. of tobacco extract (40 per cent nicotin) in 100 gal. of water to which are added from 3 to 5 lbs. of soap.

"Eggs about to hatch and newly emerged nymphs succumb to an application of the lime-sulphur solution. By postponing the dormant treatment for the San José scale until the blossom cluster-buds are beginning to separate at the tips, very effective work can be done against the eggs. The lime-sulphur should be used in the proportion of 1 gal. of the concentrate, 32° B., to 8 gal. of water. In some tests of other contact sprays the miscible oils, oil emulsions, weak dilutions of nicotin, and soapy solutions were of small value for the destruction of the eggs. Ova deposited on the twigs after the wood was thoroughly sprayed with the lime-sulphur solution hatched, and the young nymphs were not harmed through contact with the material on the bark of the trees. On the other hand, the wash having considerable amounts of sediment (15:20:50

formula) was less destructive to the eggs, but the young psyllas which hatched for the most part failed to reach the opening buds and these succumbed to the action of the sediment which became attached to their bodies after leaving the egg shells."

The pear psylla and its control, F. H. HALL (*New York State Sta. Bul. 387, popular ed. (1914), pp. 3–10, pl. 1, figs. 4*).—A popular edition of the above.

Observations and experimental studies of the life cycle of the beet plant louse (Aphis euonymi), A. MALAQUIN and A. MOITIÉ (*Compt. Rend. Acad. Sci. [Paris], 158 (1914), No. 19, pp. 1371–1374*).—The authors find that the eggs of *A. euonymi* deposited in the fall on the bean, an alternate host plant, have not hatched notwithstanding that they hatched normally on *Euonymus europeus*, the primary host plant, and that if the young which issue from eggs are experimentally placed upon the leaves of the beet they do not attempt to feed thereon. It is thought probable that in this migratory species the generation issuing from the fecundated eggs is by heredity closely restricted to its primary host plant, and that the adaptation to an alternate host plant becomes established only in later generations.

Catalogue of the Lepidoptera Phalænæ in the British Museum.—XII and XIII. Catalogue of the Noctuidæ in the collection of the British Museum, G. F. HAMPSON (*London, 1913, vols. 12, pp. XIII+626, pls. 30, figs. 134; 13, pp. XIV+609, pls. 18, figs. 130*).—Volume 12 of this work (E. S. R., 28, p. 856) catalogues the noctuid subfamily Catocalinæ and volume 13 the remainder of the Catocalinæ and the subfamilies Mominæ and Phytometrinæ.

The gipsy moth, J. BARSACQ (*Rev. Phytopath. Appl., 1 (1913), No. 5, pp. 70–73, figs. 2; abs. in Rev. Appl. Ent., 1 (1913), Ser. A, No. 12, p. 481*).—This article describes the ravages of the gipsy moth in the Crimea. The young caterpillars are frequently parasitized by *Apanteles fulvipes, A. solitarius, A. glomeratus, Pristomerus vulnerator, Echinomyia fera, Tachina larvarum*, and *T. rustica;* the more mature caterpillars and pupæ by *Sarcophaga affinis, S. albiceps, Parexorista lucorum, Pimpla instigator, Rœselia antiqua, Scotia saturnia, Theronia flavicans*, and others of less importance.

The destruction of the leopard moth, P. NOLL (*Bul. Lab. Régional Ent. Agr. [Rouen], No. 4 (1913), p. 14; abs. in Rev. Appl. Ent., 1 (1913), Ser. A, No. 10, pp. 396, 397*).—Injury to the cork oaks of the Massif de l'Edough in the Department of Constantine is said to be chiefly due to *Zeuzera pyrina*, which burrows in the trunk and branches. This pest is thought to be the same as *Z. æsculi* since the habits of the two are identical.

Carbon bisulphid is said to have been used with success in Algeria against the caterpillars of *Z. pyrina*, the liquid being injected into the gallery and the opening stopped up with plaster or clay.

The sequoia pitch moth, a menace to pine in western Montana, J. BRUNNER (*U. S. Dept. Agr. Bul. 111 (1914), pp. 11, figs. 5*).—The sequoia pitch moth (*Vespamima sequoia*) menaces the lodgepole pine timber in the area near and at the divide between the Swan River and the Clearwater River in western Montana, and is at present the most destructive insect pest in that region. Roughly the area in which the insect is a very serious factor in forest destruction is about 12 miles square, or more than 90,000 acres.

Observations of the emergence of the adult show that the general flight of the mature insects and oviposition occur between June 25 and July 15, the greater number of them probably flying about July 10 and the flight and oviposition being over by August 1. While the period required for the incubation of the egg has not been determined, the injury to the newly infested trees by the young larvæ is quite perceptible by August 15. The larvæ are said to have attained considerable size by the time frost arrests their activity

about October 1. About 30 days are passed in the pupal stage. In summarizing the life cycle, it is stated that larvæ hatching from the eggs deposited in June or July of one year develop into adults during the same months two years later, thus making the generation biennial.

This moth is apparently little subject to the attack of either parasitic or predaceous enemies. The attack of pine by *Dendroctonus monticolæ* in the Clearwater country is said to be nearly always fatal to the pitch moth since the former kills the trees almost immediately, and without the flow of sap the larvæ of the moth can not survive.

While lodgepole pine is numerically the principal species of tree in the region and, with the rare exception of the yellow pine, is the species subject to attack by the pitch moth, this moth attacks almost all kinds of conifers in other localities within its range. The infested trees are readily located by the never-absent pitch exudation over the tunnel of the larva. They are attacked at the extreme base, and the exuding pitch flows out from the tree not infrequently a distance of 10 or 12 in. upon the humus which covers the ground.

The larva begins its mine in a crevice in the bark where the egg was deposited, then proceeds through the outer layers until it reaches the cambium. Close to the wood it begins to construct a transverse mine running in both directions from where it entered. It widens this tunnel at the center, thereby causing the appearance of a central chamber. In small trees the mine is always practically straight across the grain of the wood. A count made of the annual rings and measurements on a tree which was considered to be a fair example of the general injury in the area brought out the fact that during the first 41 years of its life and normal health it added annually about $\frac{1}{4}$ in. to its diameter, while it added only about $\frac{1}{32}$ in. annually during the 23 years it had been infested by the pitch moth.

The author finds that the peculiar results of the work of this pest are the chief and primary contributing cause of the frequency and possibly continuity of fire damage to forest growth in this area. There is said to be only one way to reduce the insect and that is to destroy it while in its larval stage. By September 1 all of the eggs which have not been lost have hatched, and the young larvæ have attained a size sufficient so that they can be seen and destroyed. Killing the larvæ outright or hand picking is said to be the only method of reducing the number of this pest.

The peach tip moth, W. W. Froggatt (*Agr. Gaz. N. S. Wales, 25 (1914), No. 5, pp. 413, 414, pls. 3*).—This article relates to an undetermined tortricid, the larvæ of which were first observed four or five years ago in the vicinity of Sydney. It burrows into the side of the tips and by eating its way downward causes the terminal leaves of peach and nectarine trees to die back and the top of the injured twigs to gum. "Later on in the season it was found that a large percentage of the fruit was marked with several blotches, covered with exuding gum, under which some insect had gnawed through the skin. . . . The damage done to the surface of the fruit is more serious than that to the twigs, for it causes large scars to form before the fruit is ripe." The insects also bore distinct circular holes and gnaw irregular tunnels through the tissue of quinces and apples, but do not work into the center for the core like the codling moth.

Experiments in the destruction of fly larvæ in horse manure, F. C. Cook, R. H. Hutchison, and F. M. Scales (*U. S. Dept. Agr. Bul. 118 (1914), pp. 26, pls. 4*).—This bulletin presents the results of experiments carried on at Arlington, Va., and Audubon Park, New Orleans, La., by the Bureaus of Entomology, Chemistry, and Plant Industry of this Department working in cooperation.

Of 17 substances experimented with but two, namely, borax and calcined colemanite, gave satisfactory results. Borax in the commercial form in which it is available throughout the country was found to be by far the most effective, economical, and practical. It increases the water-soluble nitrogen, ammonia, and alkalinity of manure and apparently does not permanently injure the bacterial flora. The application of manure treated with borax at the rate of 0.62 lb. per 8 bu. or 10 cu. ft. to soil does not injure the plants thus far tested, although its cumulative effect, if any, has not been determined. It is recommended, however, that not more than 15 tons per acre of the borax-treated manure should be applied to the field.

In treating manure with borax to kill fly eggs and maggots it is recommended that 0.62 lb. of borax or 0.75 lb. of calcined colemanite be applied to every 10 cu. ft. of manure immediately on its removal from the barn. The borax should be applied particularly around the outer edges of the pile with a flour sifter or any fine sieve, and the borax-treated manure sprinkled with 2 or 3 gal. of water. "As the maggots congregate at the outer edges of the pile, most of the borax should be applied there. The treatment should be repeated with each addition of fresh manure, but when the manure is kept in closed boxes less frequent applications will be sufficient. Where calcined colemanite is available, it may be used at the rate of 0.75 lb. per 10 cu. ft. of manure, and is a cheaper means of killing the maggots. In addition to the application of borax to horse manure to kill fly larvæ, it may be applied in the same proportion to other manures, as well as to refuse and garbage. Borax may also be applied to floors and crevices in barns, stables, markets, etc., as well as to street sweepings, and water should be added as in the treatment of horse manure. After estimating the amount of material to be treated and weighing the necessary amount of borax a measure may be used which will hold the proper amount, thus avoiding subsequent weighings."

The estimated cost of treatment with borax at 5 to 6 cts. per pound in 100-lb. lots is estimated at practically 1 ct. per horse per day. If calcined colemanite is purchased in large shipments the cost should be considerably less.

A bibliography of 12 titles is appended.

[Eliminating a city's flies], J. Dawson (*Sci. Amer., 111 (1914), No. 2, pp. 28, 29, 34, figs. 9*).—This is an account of the campaign against the house fly in Cleveland, Ohio.

Flies and diarrheal disease, D. B. Armstrong (*N. Y. Assoc. Improving Condition Poor Pub. 79 [1914], pp. 29, pls. 3, figs. 3*).—This reports investigations of the Bureau of Public Health and Hygiene of the Department of Social Welfare. Although the work, which was carried on in New York City, is not considered sufficiently extended for general deductions, it is interesting and suggestive. There was apparently a marked reduction in the amount of diarrheal diseases in the area protected from flies as compared with similar unprotected areas.

Control of cabbage maggot on early cabbage, F. H. Hall (*New York State Sta. Bul. 382, popular ed. (1914), pp. 3–12, figs. 9*).—A popular edition of the bulletin previously noted (E. S. R., 31, p. 352).

The chief remedies against the larvæ and adults of Lema melanopus, a pest of summer-sown grain, E. M. Vassiliev (*Trudy Opytn. Ent. Stantsii Vseross. Obshch. Sakh. Zavod. [Kiev], 1912, pp. 1, 2; abs. in Rev. Appl. Ent., 1 (1913), Ser. A, No. 12, p. 479*).—During 1910–11 the adult and immature stages of *L. melanopus* are said to have injured oats and barley and summer-sown wheat in the Government of Kharkof.

Bothynoderes punctiventris and methods of fighting it, V. Pospielov (*Sveklovichnyi Dolgonosik i Mĕry Bor'by s Nim. St. Petersburg: Glav. Uprav. Zemleustroistva i Zeml., Dept. Zeml., 1913, 2. ed., pp. 116, pls. 3, figs. 8; rev.*

in Rev. Appl. Ent., 2 (1914), Ser. A, No. 3, pp. 177–180).—A beetle, *B. punctiventris*, is said to be one of the most permanent and serious pests of sugar beets, occurring from Austria-Hungary to Caucasia and the southern part of Siberia. The author gives a list of 25 species of Curculionidæ which he observed from 1903 to 1905 in beet plantations in Kief, of which 14 species are recorded for the first time from the beet.

Dendrolimus pini and D. segregatus, their life history, injurious activities, and methods of fighting them. I. V. VASSILIEV (*Trudy Büro Ent. [St. Petersb.], vol. 5, No. 7, 2. ed. ed. (1913), pp. 99, pls. 2, figs. 34; abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 4, pp. 220–223*).—A detailed discussion of the biology and means of controlling these forest pests.

The alfalfa weevil. R. A. COOLEY (*Montana Sta. Circ. 35 (1914), pp. 191–206, figs. 24*).—A general account of this pest which occurs in Utah, Idaho, and Wyoming but has not as yet appeared in Montana.

Birds in relation to the alfalfa weevil. E. R. KALMBACH (*U. S. Dept. Agr. Bul. 107 (1914), pp. 64, pls. 5, figs. 3*).—This bulletin dealing with the food habits and economic status of birds, and of the toad, frog, and a few other vertebrate enemies of the alfalfa weevil is based upon investigations carried on from May 8 to July 25, 1911, and from April 1 to August 15, 1912. In the course of the two seasons' work 45 species of birds were found to have eaten the pest, all of which are briefly discussed by the author.

The English sparrow was found to be a most effective enemy of the pest, this being particularly true of nestling birds in May and June. In view, however, of the ability of the bird to do serious damage to standing grain and to take heavy toll from the farmers' chicken feed, the author states that he can not recommend legal protection for this species.

The investigation is said to verify the statement frequently made that the abundance of an insect, and consequently the ease with which it may be secured, are important factors governing the food habits of birds. The ground-feeding birds come into most intimate contact with the alfalfa weevil but birds which feed on the wing may secure the insect at the time of its spring and summer flights; and such species as search for their food over trunks of trees may come into contact with a few hibernating adults. Over much of the territory covered by the author the bird enemies of the weevil have learned to search for the insect as a food in the comparatively short period of four or five years, a fact which makes the large proportion of this food eaten by some species the more remarkable.

It is stated that with the exception of a fungus disease, which in some localities destroyed large numbers of the pupæ, there probably was at the close of 1912 no other natural agency which had done more in controlling the alfalfa weevil than the native birds. The valley quail (*Lophortyx californica vallicola*) is said to be deserving of additional legal protection for a short period at least.

Egg laying of the rice weevil, Calandra oryzæ. F. H. LATHROP (*Ohio Nat., 14 (1914), No. 7, pp. 321–327, figs. 5*).—A descriptive account.

Psalidium maxillosum in the Government of Podolia on transplanted seedlings. E. M. VASSILIEV (*Trudy Opytn. Ent. Stantsii Vscross. Obshch. Sakh. Zavod. [Kiev], 1912, pp. 3–6; abs. in Rev. Appl. Ent., 1 (1913), Ser. A, No. 12, p. 478*).—The curculionid weevils *P. maxillosum* and *Tanymecus palliatus* are a source of injury to beets and the former to vine seedlings in the Government of Podolia.

Brood diseases of bees. F. C. PELLETT ([*Iowa*] *State Bee Insp. Bul. 3 (1914), pp. 12, figs. 4*).—A summarized account of the more important brood diseases.

The manioc ant (Œcodoma cephalotes). G. Devez (*Agron. Colon., 1 (1913), Nos. 5, pp. 129–135; 6, pp. 164–174, fig. 1; 1 (1914), Nos. 7, pp. 13–18; 8, pp. 42–51, pl. 1; abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 4, pp. 223–225*).—A report of studies in Guiana of this leaf-cutting ant and its destruction by means of sulphur dioxid.

A revision of the Ichneumonidæ based on the collection in the British Museum (Natural History). C. Morley (*London, 1914, pt. 3, pp. XIII+148, pl. 1*).—This third part of the work previously noted (E. S. R., 30, p. 59) deals with the tribes Pimplides and Bassides.

A first contribution to a catalogue of the zoocecidia of Switzerland. M. Moreillon (*Bul. Soc. Vaud. Sci. Nat., 5. ser., 49 (1913), No. 181, pp. 251–286*).—This catalogue is arranged according to host plants.

A case of tick bite followed by widespread transitory muscular paralysis. E. M. Eaton (*Austral. Med. Gaz., 33 (1913), No. 17, pp. 391–394; abs. in Jour. Trop. Med. and Hyg. [London], 16 (1913), No. 12, pp. 188, 189*).—This article relates to a transitory muscular paralysis in a child of 4½ years, apparently caused by *Ixodes ricinus* or *I. holocyclus*.

The predaceous mite, Pediculoides ventricosus. F. C. Willcocks (*Agr. Jour. Egypt, 4 (1914), No. 1, pp. 31–52, pl. 1*).—This paper deals with *P. ventricosus*, which has been found to be a parasite of the pink cotton bollworm in Egypt, and also discusses its relation to the outbreak of a supposed skin disease among laborers engaged in handling cargoes of Egyptian cotton seed at the London docks and at a Colchester oil mill. It is stated that so far as known *P. ventricosus* was first discovered in Egypt at Zagazig in 1908 on the pupa of a buprestid beetle (*Sphenoptera trispinosa*). The mite was first observed as a parasite of the pink bollworm in cotton seed obtained from Alexandria in 1913.

FOODS—HUMAN NUTRITION.

Concerning bouillon cubes, seasonings, and meat extract. II. K. Micko (*Ztschr. Untersuch. Nahr. u. Genussmtl., 27 (1914), No. 7, pp. 489–502*).—The results of the examination of a large number of samples are presented and discussed.

See also a previous note (E. S. R., 30, p. 257).

A note on soup cubes. E. Remy (*Pharm. Zentralhalle, 54 (1913), No. 48, pp. 1238–1240; abs. in Chem. Zentbl., 1914, 1, No. 2, p. 174*).—Data regarding the composition of commercial soup cubes are reported.

Concerning fish milt and fish roe (caviar). J. König and J. Grossfeld (*Ztschr. Untersuch. Nahr. u. Genussmtl., 27 (1914), No. 7, pp. 502–520*).—The results of special studies of the protein, fat, ash, and acid content are reported, the analytical methods followed being described.

Canned snails (*Pure Products, 10 (1914), No. 5, p. 244*).—Data are given regarding the production and marketing of edible snails, fresh and canned.

Food value of milk and its products. R. Harcourt (*Ontario Dept. Agr. Bul. 221 (1914), pp. 20*).—In this discussion of milk and milk products recipes are given for cheese dishes, and also data regarding their relative cost as sources of protein and energy in comparison with meat dishes.

Ice cream. A. McGill (*Lab. Inland Rev. Dept. Canada Bul. 276 (1914), pp. 15*).—Of the collection of samples examined, 77 were found genuine, 49 adulterated, 8 slightly below standard, and 1 sold as imitation.

The importance of Indian corn for the Colonies and for Germany as a cheap and good foodstuff. O. Rammstedt (*Tropenpflanzer, 18 (1914), No. 4, pp. 201–214*).—The importance of Indian corn as a foodstuff is pointed out in this summary of data, which includes the results of the author's own work.

The chemistry of bread making, J. GRANT (*London, 1912, pp. VIII+224, figs. 47*).—This volume deals with the application of science to the bread making industry and is designed as a guide for students in bread making. The atmosphere, water, acids, alkalis, and salts are considered in relation to baking, as well as bakery physics, cereals and their character and composition, milling, ferments, yeasts, etc., bread making processes, antiseptics and bakehouse hygiene, fuels and ovens, cereal foods, and some related topics. A bibliography is appended and an index is provided.

So-called chestnut blight poisoning, G. P. CLINTON (*Connecticut State Sta. Rpt. 1914, pt. 1, pp. 30–42*).—Since a number of cases of illness and a few deaths attributed to eating chestnuts from blighted trees have been reported in the public press, an investigation was undertaken to determine whether or not the blight fungus was poisonous and thus responsible for such trouble as had been implied.

According to the author's conclusions, the investigations showed that there may have been some relation between the illness of at least some of the persons and the eating of chestnuts. The illness might have been due "to overeating or to the eating of immature or partially germinated chestnuts, or to the age and physical condition of the persons who were made sick, or to a combination of these factors.

"On the other hand, there was no evidence discovered that the blight fungus or other fungi were directly connected with the sickness, since experimental feeding of white rats with these fungi failed to produce any injurious effects. Small amounts of pure cultures of the blight were also eaten by the writer without ill effect.

"The only connection the blight could have with such sickness would be indirect, the trees being so injured thereby as to produce a greater proportion than usual of nuts not perfectly matured which possibly contained some self-produced poisonous principle; but even this supposition does not seem very probable."

Supposed poisonous properties of chestnuts grown on trees affected with chestnut blight, C. D. MARSH (*Jour. Amer. Med. Assoc., 63 (1914), No. 1, pp. 30, 31*).—Investigation of reported cases of poisoning from eating chestnuts collected from trees affected by the chestnut blight gave no evidence that the nuts collected from such trees have any more deleterious properties than chestnuts collected from healthy trees. The symptoms attributed to eating blighted chestnuts were in almost all cases such as might be produced in some persons by chestnuts from healthy trees. Chemical examinations, as the author states, and laboratory experiments in feeding the whole fruit and in the use of extracts failed to show any toxic properties in the nuts.

Bromin compounds in table salts, L. CHELLE (*Bul. Soc. Pharm. Bordeaux, 54 (1914), No. 1, pp. 19–24; abs. in Zentbl. Biochem. u. Biophys., 16 (1914), No. 15–16, p. 592*).—A number of salts of different origin were examined and all contained bromin. From his investigations, the author concludes that the quantity of bromin absorbed with the food is probably sufficient to account for the amount normally contained in the urine.

[Food analyses and other pure food and drug topics], E. F. LADD and ALMA K. JOHNSON (*North Dakota Sta. Spec. Bul., 3 (1914), Nos. 3, pp. 17–40; 4, pp. 41–56; 6, pp. 73–88; 7, pp. 89–104*).—The first of these bulletins discusses general questions connected with the state pure food supply; gives some data regarding a test with a commercial "hog cholera specific," which indicate that "it is not a cure or preventive for hog cholera"; records the data obtained in inspections of grocery stores and meat markets; and gives a list of beverage registrations for 1914.

The second bulletin discusses macaroni and other food topics; reports results of examination of a number of drug products, proprietary remedies, and food products; gives data regarding inspection of slaughterhouses; and lists the beverages registered.

The third of these bulletins discusses macaroni and noodles, sausage frauds, bouillon cubes, and other pure food and drug topics; gives data regarding beverages registered and registrations canceled; gives the results of examinations of miscellaneous samples of food, beverages, rubber products, and damaged flax seed. Papers by C. P. Guthrie on camphor liniment (see p. 676) and by W. L. Stockham, entitled The Color of Flour from North Dakota Wheat Varieties, are also included.

According to the latter author, few factors are of more importance from the standpoint of possible improvement through blending, or breeding the improved types of wheat, than the natural characteristics of color possessed by the different varieties. The ideal color for bread would probably be slightly creamy. In considering the influence of enviroment on this natural color, the probable changes which occur in storage are taken into account. Wheat kept in storage and milled at intervals for the last few years "produced at first a creamy loaf. It is now approaching the gray to such an extent as to score lower in color. Changes take place much more rapidly in the flour than in the wheat, especially in a warm, moist atmosphere."

The author notes further that "the process of bleaching which was quite generally practiced until the last few years, has been claimed to produce changes similar to aging. The flour so treated became a lighter cream in color and gradually went over into a gray on standing, this grayness being more pronounced with the lower grades, as they contained more of the outside portion of the wheat, dirt, etc." He gives the results obtained in judging the color of a number of different varieties of the Fife, Bluestem, and Velvet Chaff wheats, and concludes that a slightly creamy color is preferable for a standard blend and that the breeder should select wheat of that type. "The Bluestem and Velvet Chaff flour mixed with the Fife, Marquis, and Ghirka, which are liable to go to the gray, should raise the standard of all."

The last of these bulletins discusses the use of snuff and the evil effects attending it; the coating of coffee; gives data regarding the examination of a proprietary remedy, and regarding the inspection of bakeries and confectionery stores; and reports beverage registrations and gives results obtained in the examination of samples of miscellaneous foods and beverages. A brief paper, Varnish Talk, by R. W. Darner, is also included.

[Food analyses and other pure food and drug topics]. E. F. Ladd and Alma K. Johnson (*North Dakota Sta. Spec. Bul., 3 (1914), No. 5, pp. 57–72*).—This bulletin discusses hog cholera nostrums, patent or proprietary medicines, reports beverage registrations, and gives results of examination of a number of samples of foods, beverages, and water.

The bulletin also includes a paper, Investigation of Commercial Condensed Soups, by L. A. Congdon, which reports analyses of many samples. According to the author's conclusions, the principal constituents found in condensed bouillons were "salt and water with some extractive of beef and added spices."

The principal constituents of celery soup were found to be "celery paste, salt, small amount of butter, spices and water [with the exception of one sample] which was composed principally of starch (probably wheat), with small amount of celery seed as flavor, salt, and water."

The condensed tomato soups "were made principally of tomato pulp, spices such as paprika, etc., salt, sugar and water."

The condensed vegetable soups were variable in their constituents; "the majority of those analyzed contained Lima beans, kidney beans, tomato pulp, barley, parsnips, carrots, peas, celery, parsley, spices, salt, water, with an extraction of a beef soup bone."

"In regard to the condensed beef soups, the principal ingredient found was vegetable matter, mostly in the form of boiled barley. This soup might better be named vegetable and beef soup. In regard to the condensed chicken soups, the principal ingredients found were rice and salt water. A compound of this kind whose chief ingredients are rice and salt water can hardly be classed as 'condensed chicken soup,' but might more properly be called 'rice chicken soup' or 'rice soup—chicken flavor.' The principal ingredients of chicken gumbo soup were boiled rice, small amount of other vegetables, and in one case a small amount of corn beef and chicken." Similar soups were also found to contain small quantities of meat substance in proportion to other constituents.

"Consomme was found to be a water-salt solution of meat extractive. Clam broth in all cases was a water-salt solution of clam extractive. In clam chowder, beside a small amount of clams, the chief ingredient was found to be boiled potatoes and some onions with some incorporated water. Pea soup in all cases was found to be principally composed of mashed peas with salt and spices."

Fourteenth annual report on food adulteration under the pure food law, W. M. ALLEN, E. W. THORNTON, and C. E. BELL (*Bul. N. C. Dept. Agr., 34 (1913), No. 12, pp. 112*).—Under the provisions of the state law a number of samples of miscellaneous food products were examined, and are here reported upon.

The department of food sanitation and distribution, DORA E. WHEELER (*Women's Munic. League Boston Bul., 5 (1914), No. 5, pp. 54–56*).—A progress report, with an outline of plans for future work.

The influence of low temperatures upon the decomposition of foods, H. KÜHL (*Hyg. Rundschau, 23 (1913), No. 17, pp. 1025–1028; abs. in Chem. Zentbl., 1914, I, No. 2, p. 173*).—The relation of ferments to the changes brought about in milk, meat, and fish during storage is considered.

According to the author, meat and fish exhibit marked differences with reference to the character of the changes brought about by autolytic processes. In the case of meat, these result in "ripening" and are desirable, whereas in the case of fish they are undesirable, the fish becoming unfit for food. Fish are therefore frozen for storage instead of kept at a low temperature above the freezing point.

One reason why canned goods should be dated, J. T. SEIDEL (*Pure Products, 10 (1914), No. 5, pp. 227–231*).—In this summary of data the author points out that the tin content of canned goods increases with age and therefore goods should be dated.

[Food and its cost at] the Garland School of Home Making (*Half Yearly Rpt. Garland School Home House 1913–14, Oct.–Feb., pp. 11*).—Resident pupils act in turn as housekeepers at this home house, located in Boston, Mass. The system of management followed is described and its statement of income and disbursements given. The total number of meals served was 2,595, at an average cost of 16 cts. per person per meal.

Cost of living in New Jersey (*Ann. Rpt. Bur. Statis. Labor and Indus. N. J., 36 (1913), pp. 153–164*).—Information is summarized regarding the retail prices of a selected list of food supplies.

"Since 1898, a period of 15 years, the average annual wages or earnings of factory and workshop employees in New Jersey show an advance of 26.9 per cent while food prices as represented by 43 articles are shown to have advanced 27.7 per cent."

Infant mortality.—[Care of children] (*Rpt. Bd. Health Wis., 24 (1911–12), pp. 124–130*).—Feeding, care of milk, clothing, and related topics are considered in this summary of statistical and other data.

A bulletin on the baby (*Bd. Health Ala. [Bul.], 1913, pp. 8*).—Infant feeding is one of the subjects discussed in this publication.

School lunches in Philadelphia (*School Lunch Com. Home and School League Ann. Rpt., 2 (1912–13), pp. 21, pl. 1, figs. 5*).—Standards in school lunch administration, the organization and administration of work, and the business and psychology of the school lunch are the subjects included in this report, together with a contribution to the bibliography of the subject.

As shown by the data collected with reference to serving cost and food cost, it appears that "the cost of food is largely determined by the number of children served. The cost of service is mainly affected by the way in which the food is served. It costs less to serve 600 in one place once than it does to serve 100 in six places or at six times. It costs less to serve food as purchased than when it requires cooking or special handling. Foods that may be stored cost less than perishable goods. Allowing for such variations, the cost of serving may be put down as between one-fourth and one-third of the total cost of food and service.

"The charge to the children can be made to cover the cost of food and service where the business is large enough and the control central and continuous. Where responsibility for the management is divided between the school and a private organization there is a loss of at least 15 per cent for service. In the case of elementary school lunches the cost of supervision can not be made chargeable to the receipts from the children, for the value of supervision is primarily educational and is properly charged against the public fund for education.

"It is not so easy to measure the degree to which attendance on the lunches is affected by the approval of the teaching staff. A few words from the teacher will do much to make a new dish popular or unpopular.

"As business increases and steadies, it is possible to get for the same money food of better quality and a greater quantity. This is because large quantities can be bought at once and advantage taken of advance-order prices. . . .

"The initial cost of movable equipment is about 10 cts. per child, . . . deteriorating at the rate of 20 per cent per year. It consists of cooking and serving utensils. This cost is kept down by having children served in relays and the dishes washed between servings. It is also kept down by the fact that not all the food sold requires serving dishes; for example, crackers.

"The fixed equipment, such as gas stoves, sink, closets and tables, is permanent, and no special fund need be set aside for its renewal. . . .

"The cost of supervision varies inversely with the numbers served. In the high schools, where large numbers are served under public control and where portions are based on 3-ct. units, $1 out of every $9 spent goes to supervision. In the elementary schools, where there are fewer lunches served, and where control is divided between the school and private committees, $1 in every $6 goes to supervision."

Is cooking an error? (*Lancet [London], 1914, I, No. 12, pp. 841, 842*).—A discussion of the general question of the destruction of vitamins by heat.

Cooking and vitamins, L. Hill (*Lancet [London], 1914, I, No. 14, p. 1002, fig. 1*).—In a communication in reply to the question raised in the above article, the author summarizes some data (including his own experimental work with pigeons), regarding vitamins, substances which occur in small amounts in a number of foodstuffs and which are necessary, "some for nutrition and others for growth."

"These," he states, "by processes of milling and canning food . . . are often removed or destroyed. Thus they are removed in the polishing of rice and in the preparation of white flour. Vitamins are soluble in water and may be removed if food is stewed and the liquor thrown away. Those separated from rice polishings are destroyed by heating to 120° C. and diminished by boiling. . . . Those present in whole meal wheat flour are not destroyed by baking. . . . The vitamins which prevent scurvy are not destroyed by boiling. . . . The addition of a very little milk to white bread, either boiled or raw, makes the latter a sufficient food. . . . So far as the evidence goes, then, the vitamins present in milk are not destroyed by boiling, and there is no objection on this ground to the sterilization of milk for infant feeding. . . .

"The question of white bread does not concern the well-to-do, who get their supply of vitamins from milk, eggs, fresh vegetables, etc., but it is of vital matter to the children of the very poor brought up on white bread, margarin, and tea. For them whole meal bread is essential."

Variations of the food and body weight under the action of solar rays in different seasons—nutrition by heat, M. DE LAROQUETTE (*Compt. Rend. Acad. Sci.* [*Paris*], *158* (*1914*), *No. 8, pp. 586–588*).—In these experiments, which extended over a period of one year, the body weight and food consumption were observed daily in the case of three rabbits exposed in glass cages to the heat of the sun. Each rabbit received a constant daily ration of 100 gm. of green vegetables, which was always eaten, and a ration of oats, of which the amount eaten depended upon the appetite of the animal.

The average amount of oats eaten varied inversely with the intensity of the sun's rays. The amount consumed per 100 gm. of body weight was approximately 4 gm. in winter, with a minimum temperature of 15° C. (59° F.); 3 gm. in the spring and fall, with a minimum temperature of 22°; and only about 2 gm. in the summer, with a minimum temperature of 30°.

From the fact that the body weight of the animals increased during the spring when there was a decrease in the amount of food consumed, and that the loss in body weight during the summer was not proportional to the decrease in the amount of food consumed, the author concludes that there is a certain absorption and utilization of the energy from the sun's rays in the case of animals as well as plants. In support of this view, he states that in the case of natives of hot countries whose more or less naked bodies are exposed to the sun's rays for a greater part of the day the fuel value of the diet is low. He cites also the beneficial results obtained by sun baths in treatment of certain cases of malnutrition, especially gout and obesity. [The author has apparently disregarded the effect of external temperature upon metabolism.]

The economy of foods possible by increase of surrounding temperature, L. LAPICQUE (*Compt. Rend. Acad. Sci.* [*Paris*], *158* (*1914*), *No. 10, pp. 732–734*).—A critical discussion of the above article.

The effects of protein starvation and feeding on the amino acid content of the tissues, D. D. VAN SLYKE and M. M. GUSTAVE (*Proc. Soc. Expt. Biol. and Med., 11* (*1913*), *No. 1, p. 25*).—Neither protein hunger nor high protein feeding influenced the amino acid content of the tissues.

"Nitrogen retained as the result of high protein feeding is not in the form of stored digestion products, but rather as body protein.

"The free amino acids of the tissues can originate not only from the food, but also from autolyzing tissues, as the latter are the only apparent source from which the amino acid supply can be maintained during starvation."

Protein metabolism from the standpoint of blood and tissue analysis.—VII, An interpretation of creatin and creatinin in relation to animal metabolism, O. FOLIN and W. DENIS (*Jour. Biol. Chem., 17* (*1914*), *No. 4, pp.*

493–502).—According to the authors, the creatinin figures recorded in connection with their experiments "clearly indicate that the creatinin does originate in the muscles, since the preformed creatinin found in the muscles, small as it is, is nevertheless invariably greater than the preformed creatinin found in the blood. We have several other experiments in addition to those recorded in this paper, all of which have yielded the same result.

"Another interesting fact . . . discovered in the course of these investigations is that though the heart yields very much less creatin than do the striated muscles, yet in nearly every case the heart contains more preformed creatinin than is found in the striated muscles. . . . According to our point of view, the figures simply indicate that the tissue metabolism in the heart is very much more rapid than the tissue metabolism in the voluntary muscles.

"Our experiments have failed to show any creatinin formation out of the administerial creatin. There is a slight accumulation of creatinin in the blood and a slight diminution of the creatinin in the muscles. It looks as if the unusually large influx of creatin into the muscles tended to force out the creatinin, but the variations are so small that we hesitate to attach much significance to them, although we have observed the phenomenon many times. If correct, this observation will help to explain the findings of those investigators who believe that the administration of creatin is accompanied by a demonstrable increase in the creatinin elimination."

See also previous work (E. S. R., 28, p. 665).

The secretory activity of stomach glands under the influence of Liebig's extract, I. Z. TOMASEWSKI (*Zentbl. Physiol., 27 (1913), No. 12–13, pp. 627–630*).—Experimental data are briefly reported in this preliminary account of the author's investigations.

The conclusion was reached that the secretion of gastric juice was due to a substance which could be extracted with ethyl or methyl alcohol from the phosphotungstic acid precipitate of the meat extract and not to any mineral matter which the extract contained. Atropin prevented the secretion. He concludes, therefore, that the active body in meat extract is probably an alkaloid similar to muscarin. When meat is boiled the lecithin present is broken down, yielding cholin, and this in turn is broken down, yielding the muscarin-like substance. Experiments have also shown, it is stated, that extractive substances differ materially from the digestion products of protein, only the former possessing the property of stimulating the intestinal secretions in this way.

The effect of change in diet on the carbon dioxid excretion of nursing infants, K. FRANK and A. NIEMANN (*Charité Ann., 37 (1913), pp. 94–100; abs. in Zentbl. Biochem. u. Biophys., 16 (1914), No. 15–16, p. 531*).—According to the author, an increased carbon dioxid excretion was noticed in changing from breast feeding to artificial feeding. This is stated to be due to the increased metabolism brought about by the larger amount of protein consumed.

Man a machine, J. O. DE LA METTRIE, trans. by GERTRUDE C. BUSSEY (*Chicago, 1912, pp. 6+216, pl. 1*).—The author has made available for English readers this work, published in the latter part of the eighteenth century. It has to do chiefly with philosophical speculations, but is interesting historically in the consideration of theories of body work. The text is supplemented by philosophical and historical notes.

ANIMAL PRODUCTION.

The composition of crops and feeding stuffs, H. J. VIPOND (*Union So. Africa Dept. Agr. [Pub.], No. 1 (1914), pp. 29*).—This treats of the nutritive requirements of animals as determined by Kellner and others, and outlines possible

rations for the different classes of farm animals. There is included a table giving the composition of farm feeding stuffs as determined by American, English, and South African analyses.

Tomato seeds for fodder (*Sci. Amer., 110 (1914), No. 15, p. 805*).—"The Chamber of French Commerce at Milan announces successful attempts to produce a valuable cattle fodder from the tomato seeds which are a by-product of the canneries. The seeds are desiccated in drying furnaces and then sifted to separate them from the woody fiber of the débris. They are then crushed by heated millstones and the oil which they contain in considerable quantities is separated by a hydraulic press. The residue is pressed into loaves, each about 2 kg. in weight. According to tests at the agricultural station at Portici, they contain an abundance of proteids and carbohydrates."

Commercial feeding stuffs.—Concerning feeding practice (*Vermont Sta. Bul. 180 (1914), pp. 187–232*).—Analyses are reported by J. L. Hills, C. H. Jones, C. G. Williamson, and G. Anderson of cottton-seed meal, linseed meal, gluten feed, distillers' dried grains, brewers' dried grains, hominy feeds, buckwheat bran and middlings, rye middlings, ground oats, rye meal, fish scrap, meat scrap, corn meal, wheat bran, middlings, red dog flour, alfalfa meal, dried beet pulp, and various mixed and proprietary feeds.

General instructions on balancing rations and feeding practice by A. A. Borland and E. H. Loveland are appended.

Inspection of feeding stuffs (*New York State Sta. Bul. 386 (1914), pp. 315–385*).—Analyses are reported of the following feeding stuffs: Cotton-seed meal and feed, linseed meal, malt sprouts, distillers' dried grains, dried brewers' grains, tankage, bone meal, gluten feed, gluten meal, hominy feed, alfalfa meal, wheat bran, middlings, dried beet pulp, screenings, buckwheat meal, corn bran, corn meal, buckwheat bran, barley middlings, beef scrap, meat meal, fish scrap, pulp, screenings, buckwheat meal, and various mixed and proprietary feeds.

The testing of calculations according to Kellner's starch values in practical feeding in Germany, A. Stutzer (*Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 2, pp. 155–158*).—The author reviews the development of the principle of starch values and comments on its importance in practical feeding operations.

In reviewing fattening experiments with oxen and pigs it is stated that without exception the rations "determined according to Kellner's starch values were correct, and that this method of reckoning the amount of feed required was preferable to all other systems." "With regard to the feeding of milch cows, there is still a difference of opinion as to what proportion of the starch values must be given in the form of digestible protein."

The mineral balance of animals, M. Hespel (*Ann. Gembloux, 24 (1914), No. 4, pp. 190–213*).—The author discusses the importance of calcium, phosphorus, magnesium, sulphur, sodium, potassium, and silicon to the animal body and the part each plays in the various body processes.

Metabolism during pregnancy and the lactation period, L. Dienes (*Biochem. Ztschr., 55 (1913), No. 1–2, pp. 124–133; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 2, p. 231*).—The results of experiments are reported on the metabolism taking place in a bitch during pregnancy and before and after the lactation period.

"The metabolism appears to decrease slightly in the middle of the term of pregnancy, while it increases considerably during the second half of the time. During lactation it is much more active than during pregnancy. During the lactation period the mother and young expend the same amount of energy

per surface unit. With the cessation of lactation the expenditure of energy rapidly decreases again."

Growth restraint of young animals by the X-ray, RICHARDSON (*Deut. Landw. Tierzucht, 18 (1914), No. 8, pp. 89, 90, figs. 2*).—The results of the application of the X-ray to chicks, lambs, young guinea pigs, and dogs indicated that the X-ray has a physiological influence in restraining growth of the animal cells, especially in the very young animals. The growth of wool on the head of lambs was restrained where the X-ray was applied soon after birth, while in older lambs less influence was noted.

Report of the animal husbandman, E. G. RITZMAN (*Porto Rico Sta. Rpt. 1913, pp. 30–34, pl. 1*).—In the cattle breeding experiments the crossing of pure-bred zebu sires of one of the largest and most improved breeds of India on Shorthorn and Hereford cows has resulted in broad framed, deep bodied, early maturing progeny. The zebu characters of constitutional vigor, active movement, strong bone, straight legs, hard hoofs, a straight, easy, and rapid gait, almost complete immunity to tick infestation, together with natural adaptation to tropical heat and short pasturage, have been retained by the progeny. The progeny of these bulls from Porto Rico cows are larger and stronger than the native stock, yearlings and 2-year-olds are larger and keep better flesh on short pasture, carry practically no ticks, keep in excellent health, are vigorous and thrifty, and show strong indications of some advance toward earlier maturity.

Sheep-breeding operations have been abandoned at the station owing to the difficulty experienced in keeping the animals in good health. Flukes are a constant menace during the rainy season. Trials with African wooll-less sheep indicate that they are not affected with scab. These sheep breed at any season after one year of age and almost without exception drop twins. They keep in good flesh, their meat is of good flavor and quality, and they are naturally adapted to this latitude. Their advantages for a hot tropical climate are a black skin, which permits of rapid radiation of excess body heat, and a yellowish-brown coat of hair, which is a good reflector of heat and light rays. Efforts are being made to improve their mutton form by selection rather than by crossing with any of the mutton breeds.

Data are also given as to work with horses and poultry.

Fattening cattle in Alabama, D. T. GRAY and W. F. WARD (*U. S. Dept. Agr. Bul. 110 (1914), pp. 41, figs. 4*).—This is a continuation of work previously noted (E. S. R., 27, p. 673; 28, p. 69; 31, p. 169) and is in three parts.

Part 1 deals with the wintering of steers preparatory to summer fattening on pasture. Two- and 3-year-old native tick-infested grades, classed as common or fair stockers, and weighing approximately 640 lbs., were used. The steers ran in inclosed fields at all times, but had no shelter aside from the natural protection of trees and hillsides, although the winter was severe. The test began in December and continued until the following March, a period of 91 days. Lot 1 of 23 animals on range alone lost an average of 106 lbs. per head during the period; lot 2 of 15 animals, receiving range plus a half ration of cotton-seed meal and hulls, gained an average of 43 lbs. per head; and lot 3 of 23 animals on range plus a half ration of coarse hay lost an average of 72 lbs. per head during the period. The steers of lot 2 received approximately 2.4 lbs. of cotton-seed meal and 8.9 lbs. of hulls per steer per day.

Comparing these results with those of the previous two winters, it is seen that in each case range-fed steers lost in live weight most heavily, the grand average for the three years showing a loss of 101 lbs. for each of the steers on range alone, a gain of 8 lbs. for those fed on meal, hulls, and range, a loss of 9 lbs. on those which received cowpea hay, a loss of 64 lbs. on those which were fed the coarse, damaged hay, and a loss of 40 lbs. for those which had

range supplemented with cotton seed. The average amount of meal and hulls consumed per day per steer during the three winters was 2.38 lbs. cotton-seed meal and 8.7 lbs. of hulls, which amount proved to be enough to make 700-lb. steers hold their fall weight throughout the winter.

It is estimated that the cost price of wintering steers when no charge is made for winter range was for the range steers 45 cts. per hundredweight, 69 cts. for cattle fed hulls and meal, 53 cts. for those receiving either cowpea hay or damaged hay, and 64 cts. for steers given cotton seed to supplement the range.

Part 2 deals with fattening steers on pasture. Native 2- to 4-year-old steers, weighing approximately 560 lbs., of mixed breeds, but the majority carrying some beef blood, were used. During 1910 the feeding period was from April 7 to August 3, and included the three lots: Pasture alone, pasture and cotton-seed cake, pasture, cotton-seed cake, and alfalfa hay; and during 1910 from April 21 to September 8, comprising two lots: Pasture alone, and pasture and cotton-seed cake. The pasture consisted of a mixture of sweet clover, Japan clover, Johnson, crab, and Bermuda grasses. During 1910 the steers received on an average 3.48 lbs. cotton-seed cake per head per day, and during 1911, 3.58 lbs. The average daily gain during 1910 was for lot 1, 1.64 lbs., lot 2, 1.98 lbs., and lot 3, 1.86 lbs. During 1911 lot 1 gained 1.75 lbs. and lot 2, 1.7 lbs. The estimated cost per pound of gain, including cost of pasture, during 1910 was 1.1, 3.19, and 4.37 cts., respectively, and during 1911, 1.02 and 4.03 cts., respectively; the average profit per steer in 1910, $6.84, $8.91, and $4.18, and during 1911, $5.28 and $6.29, respectively. The average dressing percentage of steers of lot 1 for 1910 was 51.3, lot 2, 54.2, and lot 3, 67.3; in 1911, lot 1, 51.1 and lot 2, 51.4. Hay-fed steers suffered a heavy shrinkage in weight in transit. During both years cotton-seed cake-fed steers sold for approximately one cent more per pound than pasture-fed steers. The final results agree with those of former experiments, and indicate that it does not pay to use alfalfa hay alone with pasture and cotton-seed cake, but that it does pay to feed cotton-seed cake along with the pasture.

Part 3 deals with the influence of winter feeding upon gains made the following summer and comprises three years' work, 1908–1910. Native tick-infested 2- to 4-year-old steers, averaging in weight 700 lbs., and purchased in the fall, were wintered as follows: Lot 1, range alone; lot 2, range, cotton-seed meal, and hulls; lot 3, range and cowpea hay; lot 4, range and damaged hay; lot 5, range and cotton seed. Lot 1 comprised 72 steers summer fed by groups on pasture and the following supplements: None, cotton-seed cake (medium ration), cold-pressed cake, cotton seed (heavy ration), and cotton-seed cake and alfalfa hay. The average daily losses per steer for the winter ranged between 1.19 and 0.94 lbs., and the gains for the summer between 1.79 and 2.31 lbs., making the winter and summer gains combined between 0.49 and 0.93 lb. for the several groups, with an average of 0.74 lb. Lot 2, of 68 head, comprised summer-fed groups similar to lot 1. The average daily gain per steer for the winter ranged between —6.16 and 0.63 lb.; for the summer between 1.53 and 1.92 lbs.; and for the combined winter and summer gains between 0.83 and 1.26 lbs. for the several groups, with an average gain of 1.06 lbs. Lot 3, of 24 head, comprised three summer-fed groups, as follows: Pasture alone, pasture and cotton-seed cake, and pasture and cold-pressed cake. The average daily gain per steer for the winter ranged between —0.25 and 0.07 lb.; for the summer between 1.52 and 2.22 lbs.; and the combined winter and summer gains between 0.76 and 1.22 lbs for the several groups, with an average of 1.01 lbs. Lot 4, of 43 head, comprised four groups summer fed on pasture and the following supplements: None, cotton-seed cake, cotton seed,

and cotton-seed cake (heavy ration). The average daily losses per steer for the winter ranged between 0.7 and 0.53 lb.; for the summer the gains were between 1.59 and 2.22 lbs.; and for the combined winter and summer the gains between 0.79 and 1.15 lbs. for the several groups, with an average of 0.77 lb. Lot 5, of 25 head, comprised summer-fed groups as in lot 4 and ranged in losses during the winter between 0.48 and 0.26 lb.; for the summer there were gains between 1.76 and 2 lbs.; and for the combined winter and summer gains between 0.89 and 1.07 lbs., with an average of 1 lb. The average daily gains of steers summered on pasture alone was 1.64 lbs. per head; of steers summered on pasture and cotton-seed cake (medium rations), 2.02; of steers on pasture and cold-pressed cake, 1.85; of steers on pasture and cotton seed, 2.05; of steers on pasture and cotton-seed cake (heavy rations), 1.87; and of steers on pasture, cotton-seed cake, and alfalfa hay, 2.11 lbs. per head.

A graphic presentation of the results of the three years' feeding shows that "the longer the summer-feeding period the nearer the total gains in weight approach the mean of all lots; in other words, the longer the summer period the nearer the steers, which made heavy winter losses, overcome these losses and approached the weight of the winter-fed steers. If the feeding periods [112 and 154 days] had been 60 days longer, and all steers had continued to increase in weight at the rate they had established during the actual summer-feeding period, the total gains at this time would have been practically the same for all lots, irrespective of the method of wintering."

The results of these feeding trials are summarized, in part, as follows:

"Cattle which became very thin during the winter made larger daily gains the following summer on pasture than steers which were in better flesh at the beginning of the pasture season. Usually the greater the winter loss experienced, the greater was the gain the following summer, and vice versa.

"Steers which are to be finished for the early summer markets should enter the pastures in good flesh in the spring. Such cattle sell for a premium which justifies the expense of giving them feed in addition to the range during the winter months and a heavy ration of cotton-seed cake while on pasture during the summer. . . .

"When cotton seed is worth but $14 per ton it can be used with greater economy than cotton-seed meal and hulls for wintering steers which are to be finished on pasture the following summer."

Cattle raising in South America (*Daily Cons. and Trade Rpts. [U. S.], 17 (1914), No. 106, pp. 693–699*).—In these reports attention is directed to the opportunities for future development of the cattle industry in Chile, Colombia, and Argentina.

Care and management of sheep on the farm. R. F. Miller (*Montana Sta. Circ. 31 (1913), pp. 89–112*).—This circular gives general information on the feeding, care, and management of sheep and lambs and includes a discussion of shearing, packing, and storing wool and the treatment of sheep for parasites and disease.

A review of American investigations on fattening lambs with special reference to the protein and energy requirements, S. Bull and A. D. Emmett (*Illinois Sta. Bul. 166 (1914), p. 48, figs. 4; abstract, pp. 3, 4*).—"From the results obtained in this review, which embrace 265 lots containing in all 5,127 lambs, the following average values for protein and energy are suggested as being, in general, the most economical for fattening lambs: (a) Lambs weighing 50 to 75 lbs., 3.1 to 3.3 lbs. of digestible protein and 17 to 19 therms of net energy. (b) Lambs weighing 70 to 90 lbs., 2.5 to 2.8 lbs. of digestible protein and 18 to 20 therms of net energy. In certain instances 1.8 to 2 lbs. of digestible protein and 18 to 20 therms of net energy are sufficient. (c) Lambs weighing

90 to 110 lbs., 2.2 to 2.4 lbs. of digestible protein and 17 to 20 therms of net energy. (d) Lambs weighing 110 to 150 lbs., 2.6 to 3 lbs. of digestible protein and 16 to 19 therms of net energy. It seems probable, however, that 1.4 to 1.9 lbs. of [digestible] protein would be sufficient for lambs of this weight."

A bibliography is appended.

The digestion of crude fiber by sheep and pigs, G. FINGERLING, E. BRETSCH, A. LÖSCHE, and G. ARNDT (*Landw. Vers. Stat., 83 (1913), No. 3–4, pp. 180–210; abs. in Internat. Inst. Agr. [Rome]. Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 2, pp. 231–233*).—Four digestion trials were conducted with two wethers and two pigs, each period lasting 11 days. The wethers received during the first period a basal ration of meadow hay, gluten, starch, and salt; the pigs, a basal ration of ground barley, fish meal, and salt. During the second period both the wethers and the pigs received the basal ration plus "digested" straw, in the third period the basal ration and grass, and in the fourth period the basal ration and wheat chaff, in which the crude fiber was much lignified. The "digested" straw was prepared by boiling it under pressure with alkali.

The average digestion coefficients for the three fodders experimented upon are given in the following table:

Digestibility of "digested" straw, grass, and wheat chaff by sheep and pigs.

Kind of animal.	Dry matter.	Organic matter.	Protein.	Fat.	Nitrogen-free extract.	Crude fiber.	Ash.
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
"Digested" straw:							
Wethers	72.65	73.19	.....	.....	72.23	77.27	55.20
Pigs	101.22	88.85	.....	.....	63.75	94.81	.....
Grass:							
Wethers	65.29	69.77	76.85	66.93	67.29	69.49	37.68
Pigs	49.58	51.86	52.05	84.35	52.07	39.39	35.92
Wheat chaff:							
Wethers	40.33	16.93	55.56	.....	51.54	30.34	19.86
Pigs	20.53	22.95	.....	.....	27.86	.....	12.85

"It will be seen from the above that the pigs digested the crude fiber which was not or only slightly lignified better than the sheep, while the latter were able to utilize better the crude fiber more or less [covered] with encrusting matter. The better utilization of the crude fiber of 'digested' straw by pigs depends partly upon the fact that with the sheep some of the crude fiber of the basal ration escapes digestion. It can therefore hardly be stated that pigs are superior to ruminants in their power of dissolving pure cellulose. The pigs digested 39.39 per cent of the cellulose of grass, but they were not able to attack that of wheat chaff, the reason of this difference being that the incrustations are less readily dissolved in the alimentary canal of pigs than in that of ruminants. The superiority of ruminants as regards the power of dissolving cellulose in young grass and in wheat chaff is very probably due to the finer division obtained by better mastication and to a more intense fermentation of the feed in the digestive organs.

"Summarizing the results, it may be said that pigs are as capable as ruminants of dissolving pure crude fiber or that containing but little encrusting matter, but lose this power in proportion as the encrustation or lignification of the crude fiber increases."

Swine fattening with large quantities of potatoes, F. LEHMANN (*Mitt. Ver. Deut. Schweinezüchter, 21 (1914), Nos. 6, pp. 107–112; 7, pp. 128–133; 8, pp. 149–153*).—Successful trials in feeding large quantities of potatoes to fattening swine are reported. It was found necessary to supply protein in the form of meat meal or fish meal, together with a small grain allowance of barley meal.

Potato-fed swine compared favorably with corn-fed and barley-fed swine. It is suggested that the potato ration be supplemented with an allowance of lime.

Horse-feeding experiments, R. W. CLARK (*Montana Sta. Bul. 95 (1913), pp. 57–66*).—In experiments to determine the amount and kind of hay to feed horses it was found that "the horses that received the smaller amount of hay (two-thirds as much as they would have eaten) had more life and sweat less than those that were unlimited in their hay. Clover hay proved as satisfactory as timothy hay when not more than 1 lb. per day for every 100 lbs. of live weight was fed. Horses doing light work can be carried through the winter on 0.75 lb. of hay and 0.5 lb. of grain per 100 lbs. live weight per day. Early cut timothy hay was relished more and eaten in larger quantities than late cut timothy hay."

A continued study of constitutional vigor in poultry, C. A. ROGERS (*New York Cornell Sta. Bul. 345 (1914), pp. 439–457, figs. 4*).—In continuing work previously noted (E. S. R., 28, p. 367), two pens of yearling hens and four pens of pullets, White Leghorns, were studied. The yearling hens had participated in the previous experiment, while the pullets were the progeny of earlier lots.

The conclusions confirm those of the earlier studies. Among the pullets the strong flocks consumed more feed than the weak flocks, but produced more eggs. The reverse was true of the yearling hens, probably due to the presence of several exceptional layers in the weak flock. The consumption of ground grain and meat scrap was in favor of the flocks that produced the largest number of eggs. The heaviest-producing flocks consumed a larger amount of feed, a lower proportion of carbohydrates and fat to total dry matter consumed, and a higher proportion of protein to carbohydrates and fat consumed than did the others. In general the cost of eggs for each dozen eggs laid was less for the strong than for the weak flocks. As to the number of pounds of feed consumed for each dozen eggs laid, the heavier the laying the less was the consumption, with one exception.

The fertility of the eggs in all pens was high, but the percentage of eggs hatched was variable. In the weight of eggs set there was not much difference between the strong and the weak flocks or between the yearling hens and pullets. In general the mortality among the chicks varied in proportion to the size of the hatch. In each comparison the eggs that hatched better produced a larger proportion of chickens that lived beyond the critical period of the first six weeks. In general the advantage in low mortality was with the strong flocks. From a financial standpoint the balance profit in the case of the pullets was decidedly in favor of the strong flocks, but in favor of the weak flocks in the case of the yearling hens, which was an exceptional flock throughout the study.

In summarizing all flocks, including those of early studies and comparing the averages of the strong with the weak, it is noted that the number of pounds of dry matter consumed per pound of live weight averaged the same for both the strong and the weak flocks. The strong fowls required, however, only 7.68 lbs. of feed for every dozen eggs laid, while the weak flocks required 8.46 lbs. of feed, and difference in cost of production was nearly 1 ct. a dozen in favor of the strong flocks. The strong flocks produced an average of 17.75 more eggs per hen than the weak, and the actual difference in profit amounted to 40 cts. a hen in favor of the strong hens. There was little difference in the hatching record, but a difference of 1.4 per cent mortality in favor of the strong pens.

From these results the advantages of selection of fowls are deemed evident. It is suggested that one selection only "is not sufficient to keep a flock consistently superior. The selection of mature pullets is of more value than that of partly grown chickens. Selection at the beginning of the second year is of equal importance with that in the first year. The heavier-laying hen is not

necessarily the stronger hen at all times of the year; and [results indicate] that in selecting for breeding stock to produce a large number of chickens and capable pullets, the first essential is to select according to strength, with the expectation that hens so selected will usually be the most productive."

A biometrical study of egg production in the domestic fowl.—III, Variation and correlation in the physical characters of the egg, R. PEARL and F. M. SURFACE (*U. S. Dept. Agr., Bur. Anim. Indus. Bul. 110, pt. 3 (1913), pp. 171–241, figs. 14*).—This bulletin is a continuation of work previously noted (E. S. R., 24, p. 675), and reports the results of a detailed study made of the normal variation and correlation of the egg of the domestic fowl in respect primarily to size and shape. While the studies were made with the egg of the Barred Plymouth Rock, it is thought probable that many of the results found for the egg of this breed will also obtain for the eggs of other breeds. The authors summarize their results as follows:

"The egg is, to a significant degree, relatively more variable in length than in breadth. The egg is considerably more variable in shape, as measured by the length-breadth index, than it is in either of the linear dimensions length or breadth. The weight of the egg and its volume (determined from length and breadth on the assumption that the egg is a perfect prolate spheroid) are much more variable than any of the other characters. There is a close agreement between the egg of the domestic fowl and the human skull in respect to the degree of variation exhibited in the corresponding size and shape characters of the two structures. A consideration of the processes concerned in the production of the definitive size and shape of the egg and the skull suggests, though it does not prove that this similarity with reference to variation constants is not fortuitous, but rests upon a basis of general similarity in regard to mechanical factors operative in both cases during the development and fixation of the final form.

"With the exception of breadth, all other dimensional characters studied show significantly skew (asymmetrical) variation. The different egg dimensions give frequency distributions following different ones of Pearson's curve types. Variation of the egg in length and in shape (length-breadth index) follows a curve of type IV; variation in breadth type II, and variation in volume type I.

"All of the egg dimensions studied are positively correlated with each other in varying degree. Intraracially egg length and egg breadth are correlated only slightly. Furthermore, neither the weight nor the volume of the egg is more than very slightly, if significantly at all, correlated with its shape. As would be expected, both length and breadth are significantly correlated with the weight and the volume of the egg. The bulk measures (volume and weight) are more highly correlated with breadth than with length. There is a very high correlation between volume and weight. This implies what was found in fact to be the case, that the specific gravity of the egg exhibits only a very small degree of variation. There is no significant net correlation between the shape of an egg and its absolute size. The skull and the egg show a correspondence in respect to the degree to which their chief dimensions are correlated. The correlation results parallel those set forth above for simple variation.

"A detailed study of the regression of the weight of the egg on length and breadth results in certain equations from which the former quantity can be estimated from a knowledge of the linear dimensions of the egg with a considerable degree of accuracy. A comparison of the egg of the domestic fowl with those of a number of species of wild birds in respect to relative variability leads to the result that in general the eggs of wild birds are neither less nor more variable than those of the domestic bird. It is concluded that probably

the essential factors concerned in the determination of the degree of variation in size and shape exhibited by birds' eggs are purely physiological and in no direct or immediate way (if at all) related to the action of natural selection. It does not appear from the evidence that it is essential to the survival of a wild bird that its egg shall be less variable than those of the domestic fowl, in which egg variation obviously has no survival value whatsoever.

"A study of intraindividual variation indicates that the relative variability of eggs is a definite characteristic of the individual, some birds characteristically laying eggs which are extremely variable and other birds characteristically producing eggs which are very uniform. There is on the average a considerable reduction in variability in passing from the race to the individual. This amounts in the case of length to 32 per cent and in the case of breadth to 41 per cent. Some individuals may show a greater variability both absolute and relative than a random sample of the eggs of the race from which the individual comes. The rule that length is more variable than breadth is reversed in the eggs of some individuals. Seven per cent of the birds studied produce eggs which are more variable in breadth than in length. In general a hen which characteristically lays an egg longer than the average also lays an egg which tends to be wider than the average. The same sort of correlation holds in regard to the variability of the product. A hen which characteristically lays an egg which is unusually variable in length also exhibits an unusual degree of variation in the breadth of her product."

These "data are of value in connection with all physiological and genetic studies in regard to the production of eggs. They also have a significant relation to the economic problem of the improvement of eggs in respect to quality and uniformity by breeding."

Artificial hatching of chicks, W. F. SCHOPPE (*Montana Sta. Circ. 34 (1914), pp. 169–189, figs. 5*).—This circular gives general information on the care and management of incubators, the type of eggs to use for hatching, etc.

DAIRY FARMING—DAIRYING.

Investigations in milk production, T. L. HAECKER (*Minnesota Sta. Bul. 140 (1914), pp. 7–79*).—This is a continuation of work previously noted (E. S. R., 14, p. 1003), a portion of the results of which are used in the general summary of results in the present work. The studies herein reported covered seven winters, 1902–1909.

A summary of the average dry matter and digestible nutrients consumed and dairy products yielded daily during nine winters of stall-feeding is given in the following table:

Summary of average nutrients consumed and dairy products yielded per cow in stall feeding.

Winter.	Nutritive ratio of rations.	Dry matter	Digestible protein.	Digestible carbohydrates.	Digestible ether extract.	Milk fat produced.	Solids-not-fat produced.
		Lbs.	*Lbs.*	*Lbs.*	*Lb.*	*Lbs.*	*Lbs.*
1894–1895	1 : 6.8	24.40	2.00	12.46	0.56	1.069	2.09
1895–1896	1 : 5.3	23.91	2.59	12.24	.67	1.011	2.02
1902–1903	1 : 9.4	19.86	1.28	11.16	.46	.931	2.06
1902–1903	1 : 6.7	21.77	1.92	11.86	.48	1.048	2.21
1903–1904	1 : 9.0	19.68	1.32	11.04	.39	.996	2.10
1903–1904	1 : 6.1	20.65	1.97	10.99	.36	1.032	2.02
1904–1905	1 : 9.8	20.52	1.30	11.71	.50	.852	1.81
1904–1905	1 : 6.8	21.97	1.92	11.95	.50	1.030	2.11
1905–1906	1 : 8.3	21.86	1.63	12.55	.50	1.013	2.14
1906–1907	1 : 8.3	22.87	1.74	13.05	.63	1.068	2.26
1907–1908	1 : 8.1	23.89	1.75	12.78	.64	1.094	2.28
1908–1909	1 : 7.7	24.13	1.86	12.62	.80	1.094	2.29

"From this table it is seen that during the winter of 1894–1895, with a daily protein supply of 2 lbs. and a nutritive ratio of 1:6.8, there was obtained a greater yield of milk fat than during any winter following until the winters of 1907–1908 and 1908–1909. The period covered by the data was 154 days, and the members of the herd maintained their body weight. During the winter of 1895–1896 the daily average protein supply was 2.59 lbs. and a nutritive ratio of 1:5.3, with a depression in the yield of milk fat and solids-not-fat, and an increase in the weight of the cows."

From 1902–1905, the herd was divided into two groups, one receiving a low protein and the other a high protein allowance. The milk-fat yield of the low-protein group for all three years was uniformly the lower.

The following table "was arranged by eliminating the data for the three groups with low-protein rations, and converting the average nutrients consumed per day each winter to nutriment. This was done by multiplying the ether extract in the rations by 2.2, adding the product to the carbohydrates and protein in the rations, multiplying the butter-fat yielded daily by 2.25, adding the solids-not-fat to obtain the total product, and calculating the nutriment used for body maintenance, the net nutriment per unit of product, and the weights of the herd."

Summary of average live weight, nutriment daily, total for maintenance, for product, and in product yielded, and net nutriment per pound of product.

Winter.	Live weight.			Nutriment.			
	First half of period.	Second half of period.	Total.	For maintenance.	For product.	Total in product daily.	Net nutriment used per pound in product.
	Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
1894–1895	954	958	15.69	7.57	8.13	4.490	1.81
1895–1896	.....	.....	16.30	7.75	8.55	4.295	1.99
1902–1903	882	878	14.84	6.96	7.88	4.576	1.72
1903–1904	900	913	13.74	7.18	6.56	4.341	1.51
1904–1905	896	905	14.98	7.14	7.84	4.427	1.77
1905–1906	868	861	15.27	6.85	8.43	4.425	1.90
1906–1907	908	906	16.18	7.19	8.99	4.663	1.92
1907–1908	864	866	15.95	6.85	9.10	4.741	1.92
1908–1909	933	939	16.25	7.41	8.84	4.751	1.86
Average	901	903	15.47	7.20	8.27	4.523	1.83
Average without 1902–1903	903	907	15.55	7.24	8.31	4.517	1.84

"The exceptional amount of nutriment charged to a pound of product, 1.99, during the winter of 1895–1896 was due to the fact that part was diverted to gain in weight at the rate of 0.2 lb. per day during period II. The exceptionally small amount used during the winter of 1903–1904 is due, at least in part, to the fact that more roots were fed than during any other winter, and possibly to light feeding and a narrower nutritive ratio. The large yield, 4.576 lbs. for the winter of 1902–1903, was due to the fact that it covered a period of only 97 days."

It is stated that heavy feeding, as a rule, causes more waste than light feeding. It appears that during the last four winters more net nutriment was consumed to a pound of product yielded. A study of the relation of the feed to the size of the cows "shows that the average amount per day of nutriment consumed per 1,000 lbs. live weight ranged from 15.15 to 18.44 lbs., and averaged for the eight winters 17.03 lbs. After deducting the amount calculated for

maintenance, that which remained available for product ranged from 7.23 to 10.52 lbs. and averaged 9.11 lbs. Of this there appeared in the milk solids yields ranging from 4.401 to 5.481 lbs. and averaging 4.952 lbs."

During the four winters in the period previous to 1905 the cows received per 1,000 lbs. live weight 16.22 lbs. of nutriment per day, with a nutritive ratio of 1:6.2, and returned an average daily product of 4.699 lbs., being 1 lb. of product to 1.77 lbs. of net nutriment.

During the four succeeding winters the cows received 17.83 lbs. of nutriment daily with a nutritive ratio of 1:8.1 and returned an average daily product of 5.205 lbs., being 1 lb. of product to 1.9 lbs. of net nutriment.

A study of the variation in nutriment consumed per 1,000 lbs. live weight shows that the average consumption ranged from 15.15 to 18.44 lbs. per day, and the average for seven winters was 17.08 lbs. The average product yielded ranged from 4.693 to 5.481 and averaged 5.031 lbs. of water-free solids. Aside from two winters when conditions were abnormal the percentages returned in product during the other years were remarkably uniform, the greatest variation being only 0.9 per cent. The average percentage returned in product for all seven years was 29.49.

Analyses were made of 544 samples taken from 7,616 milkings, and the milk divided into 10 grades testing from 2.5 to 7 per cent fat. It is seen that "as milk increases in fat content it also increases in protein content, but not at the same rate. In a general way, an increase of 0.5 per cent in fat is followed by an increase of 0.02 per cent in protein. . . . The sugar content of milk increases from 4.6 per cent in milk testing 3 per cent fat to 4.98 per cent in 5 per cent milk, and then gradually decreases to 4.84 per cent in 7 per cent milk. The carbohydrate equivalents of the total solids of the different grades of milk range from 14.03 for 3 per cent milk to 21.81 for 7 per cent milk. The nutritive ratio of the various grades of milk ranges from 1:4.23 for milk testing 3 per cent fat to 1:4.88 for milk testing 7 per cent fat. In 3 per cent milk there are 2.43 lbs. of solids-not-fat to 1 lb. of milk fat; and in 6 per cent milk, 1 lb. of fat to 1.45 lbs. not fat, indicating that milk fat only is not a logical basis for feeding for milk production."

Comparing the relation of the solids of milk taken from cows while on low-protein ration and on medium-protein ration, it is shown "that without exception the cows gave milk containing a lower percentage of solids when fed a ration containing a nutritive ratio of 1:9.4 than they did when receiving rations ranging in nutritive ratio from 1:6 to 1:8.3 and when on pasture. There was also a depression in both fat and protein in every case. Taking the total solids as a basis the fat is lowered 1.2 per cent and the protein 1.3 per cent, and the milk sugar or carbohydrate raised 2.2 and the ash raised 0.3 per cent, thus offsetting the depression in fat and protein."

During the first four years, when the nutritive ratio of the rations averaged 1:6.2, "the daily protein supply was 1.95 lbs. with a daily yield of 24.5 lbs. of milk containing 1.045 lbs. of fat and 2.11 lbs. of solids-not-fat, while during the last four years [when the nutritive ratio averaged 1:8.1], the daily protein supply was 1.745 lbs. with a daily average yield of 25.6 lbs. of milk containing 1.067 lbs. of fat and 2.244 lbs. of solids-not-fat.

"Of the 1.95 lbs. daily protein supply during the first four years, 0.64 lb. is the protein calculated for maintenance. . . . The daily average protein content in the milk was 0.781 lb., being a return of 1 lb. of milk protein to 1.68 lbs. of net crude protein in the ration, with a yield of 4.462 lbs. of total product in milk solids reduced to a common factor. During the last four years there was a daily supply of 1.74 lbs. of crude protein with calculated protein require-

ments for maintenance of 0.63 lb. . . .. the daily average protein content in the milk, 0.806 lb., being a return of 1 lb. of milk protein to 1.38 lbs. of net crude protein in the ration, with a daily yield of 4.645 lbs. of total product in milk solids."

Based upon these results a table has been calculated which gives the estimated organic composition of milk for each 0.1 per cent increase in percentage of fat from 2.5 to 7, and the net nutriment prescribed for production. The following table is a contracted form of the complete table:

Estimated composition of milk for each 0.5 per cent increase in fat content, and net nutriment recommended for production.

Organic solids.			Solids in carbohydrate equivalent.	Components in 1 lb. of milk in carbohydrate equivalent.		Net nutrients for the production of 1 lb. of milk.		
Fat.	Protein.	Carbohydrates.		Nitrogenous.	Nonnitrogenous.	Protein.	Ether extract.	Carbohydrates.
P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*
2.5	2.55	4.45	12.62	0.0255	0.1007	0.0146	0.0151	0.176
3.0	2.68	4.60	14.03	.0268	.1135	.0169	.0170	.199
3.5	2.81	4.75	15.43	.0281	.1262	.0192	.0189	.221
4.0	3.08	4.85	16.93	.0308	.1385	.0539	.0208	.242
4.5	3.27	4.97	18.36	.0327	.1509	.0572	.0226	.264
5.0	3.45	4.98	19.68	.0345	.1623	.0604	.0243	.281
5.5	3.65	4.92	20.94	.0365	.1729	.0639	.0259	.302
6.0	3.82	4.91	22.23	.0382	.1811	.0668	.0276	.322
6.5	4.12	4.90	23.64	.0412	.1952	.0721	.0293	.342
7.0	4.22	4.81	24.81	.0422	.2057	.0738	.0308	.359

The standard for body maintenance proposed is 0.07 lb. of crude protein, 0.7 lb. of carbohydrates, and 0.01 lb. of ether extract per 100 lbs. in live weight. The application of this standard to ration calculation is explained in full.

The appendixes include tables on the composition of feeds used and milk produced, and other data.

Clover and corn silage as feeds for dairy cows, R. W. CLARK (*Montana Sta. Bul. 94 (1913), pp. 33–54, figs. 3*).—As an average of three experiments of two periods each, and comparing clover hay and clover silage as feeds for dairy cows, the average daily production of milk per head on clover hay was 22.8 lbs. and of fat 0.93 lb., while on clover silage the daily production of milk was 24.08 lbs. and of fat 0.97 lb. On clover hay the cost of producing 100 lbs. of milk was 73.9 cts. and of 1 lb. of fat 17.9 cts., while on clover silage the cost of producing 100 lbs. of milk was 73.4 cts. and 1 lb. of fat 17.8 cts. It is estimated that in milk production 2.33 lbs. of clover silage was required to equal 1 lb. of good clover hay.

The average value of clover silage for milk production is estimated at $2.55 per ton, of corn silage $2.38. Clover silage was relished by the cattle during the winter months, but became dark in color, strong in odor, and was not relished after the weather became warm.

Experience elsewhere with clover silage is summarized, and brief descriptions given of the silos at the station.

On the possibility of increasing the fat content of milk, GRUMME (*Ztschr. Expt. Path. u. Ther., 14 (1914), No. 3, pp. 549–554; abs. in Zentbl. Physiol., 28 (1914), No. 5, p. 286*).—Three goats fed an ordinary ration produced during four days an average of 2.97 kg. milk per day, testing 4.2 per cent fat, while during three days fed a preparation, malt tropon, at the rate of 200 gm. per animal per day, they averaged 3.5 kg. milk per day, testing 5.62 per cent fat.

The comparative composition of human milk and of cow's milk, E. B. MEIGS and H. L. MARSH (*Jour. Biol. Chem., 16 (1913), No. 1, pp. 147–168, figs. 2*).—"Human milk differs from cow's milk in three important ways. It contains considerably more lactose than cow's milk and more substances of unknown nature which contain little or no nitrogen; it contains very much less protein than cow's milk. The composition of milk varies more or less regularly with the progress of lactation so that average figures for its composition are not very satisfactory. The following, however, may be taken as the limits of normal variation of the constituents of the two kinds of milk from the beginning of the second month of lactation onward, the figures representing percentages of whole milk. Human milk, protein 0.7 to 1.5 per cent, fat 2 to 4 per cent, and lactose 6 to 7.5 per cent; cow's milk, protein 2.5 to 4 per cent, fat 2 to 4 per cent, and lactose 3.5 to 5 per cent.

"Both kinds of milk contain substances [some of which can be crystallized], which are important constituents of diet, which are soluble in alcohol and ether, which contain little or no nitrogen, but of which the chemical nature is still unknown. These substances are most plentiful in early human milk and diminish in amount with the progress of lactation. Early human milk contains about 1 per cent of these unknown substances; milk from the middle period of lactation about 0.5 per cent. Cow's milk from the middle period of lactation contains about 0.3 per cent of the unknown substances."

Many of Camerer and Söldner's results were verified.

On the hygienic bacteriological character of Bern market milk with reference to the presence of tubercle bacilli, J. THÖNI (*Centbl. Bakt. [etc.], 1. Abt., Orig., 74 (1914), Nos. 1–2, pp. 11–69, fig. 1*).—Tests were made and the results compared of the leucocyte, fermentation, catalase, and alizarol methods and the germ estimate or count. Aside from the catalase test all demonstrated the need of a strict hygienic control of market milk. The leucocyte and fermentation tests were considered the most practical for general use.

A new method of determining milk quality, F. H. HALL (*New York State Sta. Buls. 373 and 380, popular ed. (1914), pp. 3–15, pls. 2*).—This is a popular edition of Bulletins 372 and 380, previously noted (E. S. R., 31, pp. 78, 372).

Cream testing, H. H. DEAN (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 39 (1913), pp. 95–99*).—Continuing previous work (E. S. R., 30, p. 74), a comparison of weekly, semimonthly, and monthly composite tests showed all of these methods to be practically correct. Composite samples kept in open bottles tested too high. There was not much difference in the average results, whether glass, cork, wood, or paper cap stoppers were used. Creosote proved to be a good preservative and has the advantage of requiring less sulphuric acid for a test than the preservatives commonly used. Formalin as a preservative tends to require a larger volume of sulphuric acid when making the test.

A new casein-fat milk test is described, in which 20 cc. of acid mercuric nitrate (made by dissolving mercury in twice its weight of nitric acid, of a specific gravity of 1.42, to which an equal bulk of water is added after solution and diluted with 30 times its bulk of water) is placed in a test bottle, then 5 cc. of milk, and the whole allowed to stand from six to seven minutes without shaking. The temperature of the milk and acid should be between 65 and 70° F. The bottles are then placed in a centrifuge, 15 in. in diameter, and whirled at a speed of 2,000 revolutions per minute for from seven to eight minutes. The bottles are then read in percentage as combined casein and fat.

Results of this test agree quite closely with separate determinations of fat and casein made by other methods.

Butter making, H. H. DEAN (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 39 (1913), pp. 71–73*).—This report continues previous work (E. S. R., 30, p. 75).

In comparing the yield obtained in salted and saltless butter, 103.37 lbs. of the former was secured per churning as against 99.66 lbs. of the latter, while the average moisture contents were 14.83 and 14.78 per cent, respectively. A comparison of Canadian and English brands of salt for butter making again showed very little difference in the results obtained.

In working butter in a combined churn it was observed that the average percentage of moisture in the finished butter was increased about 0.25 per cent and the salt nearly 0.2 per cent by keeping the churn drainage tap closed during the working of the butter, and the butter scored over one point higher. This practice, however, is not advised until further tests have been made.

Butter held in cold storage for three months was found to have decreased nearly 2 per cent in moisture from the time of printing.

Farm butter making.—Creamery industry in Montana, R. C. JONES (*Montana Sta. Circ. 32 (1913), pp. 113–152, figs. 22*).—This circular includes general information on approved methods of farm butter making, together with a discussion of the organization and management of creameries, and plans for creameries and cheese factories.

Siberian butter of Hamburg markets, P. BERG (*Ztschr. Untersuch. Nahr. u. Genussmtl., 27 (1914), No. 12, pp. 881–893, fig. 1*).—An account of the Siberian butter which has been found in great quantity on the Hamburg market, together with a study of its acidity, refraction, Reichert-Meissl and Polenske numbers, melting point, water, and salt content. A large percentage of the samples range from 10 to 15 per cent in water content. The butter has a good flavor, but is not deemed desirable for cooking purposes.

Cheddar cheese experiments, H. H. DEAN (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 39 (1913), pp. 74–91*).—The results of tests comparing milks of high and low fat and casein contents for cheese making agree with previous work (E. S. R., 30, p. 76), and showed a gain per 1,000 lbs. of milk of 5.57 lbs. of cheese by using the milk with the higher percentages of casein and fat. The cheese made from this milk also contained a higher percentage of fat, but there was not much difference in the percentages of moisture contained in the green or ripe cheese from the two lots, or much difference in the quality of the cheese.

There was little difference in the yield or quality of cheese whether ripened above normal, with 0.21 per cent acid, or below normal with 0.177 per cent acid. Overripe milk for cheese making produced 4.69 lbs. less cheese per 1,000 lbs. milk than normal milk, and required on the average 0.65 lb. more milk to make a pound of cheese. The shrinkage during one month was greater, the moisture in both green and ripe cheese was higher, and the quality of the cheese was inferior from the lots of overripe milk.

Cheese from curds salted high, 2¾ lbs. per 1,000 lbs. milk, contained slightly less moisture and scored slightly lower than curd salted at 2¼ or 2½ lbs. per 1,000 lbs. milk. Cheese ripened in ice cold storage retained more of the original cheese moisture during the month of testing than cheese ripened in an ordinary room at from 60 to 70° F. Most of the moisture loss took place in both lots during the first week and in the first inch of the cheese from the surface inward. It was evident that the moisture near the center of the cheese remains fairly constant during a ripening period of one month whether the cheese was ripened in cold storage at 40° or in a room where the temperature ranged from 60 to 70°. The shrinkage was slightly lower in the cheese ripened in 40°, but both lots contained about the same percentage of moisture in the green and ripe cheese.

Whey obtained in making Camembert cheese from raw milk contained 0.015 per cent fat; from pasteurized milk, 0.01 per cent. Whey obtained in making double cream cheese from raw milk contained 0.272 per cent fat, from pasteurized milk 0.228 per cent. In making buttermilk cheese the results depended to a great extent on the kind of buttermilk used. Cream that was pasteurized sweet gave good results, while cream that was ripe or partially ripened before pasteurizing gave as a rule poor returns. It was often very fine in grain and pasty, and in some cases there was no coagulation.

Methods of making Stilton and Wensleydale cheese are described, and notes given on other cheeses.

VETERINARY MEDICINE.

Text-book of milk hygiene, W. Ernst, trans. by J. R. Mohler and A. Eichhorn (*Chicago, 1914, pp. X+281, pls. 5, figs. 29*).—This is the first American edition of this work, and is an authorized translation of the German edition noted (E. S. R., 29, p. 877). The book treats of the subject from the standpoint of veterinarians, who according to the preface are "the proper experts who must stand by the side of the producers and give them the necessary advice and instruction."

In the preparation of the English edition the conditions prevailing in this country have been especially considered, and accordingly much material has been included from the reports of the various milk commissions and other sources. The chapter dealing with the German laws and regulations relating to the handling, production, and standards of milk has been replaced by a chapter which deals solely with the conditions and standards existing in the United States. Various tests, microscopical and otherwise, for judging milk, which may be easily conducted by the veterinarian, are presented. The methods for eradicating tuberculosis from dairy herds are plainly although briefly stated, and the relation of bovine tuberculosis to tuberculosis in man, especially alimentary tuberculosis, is discussed. The subject of mastitis is given special treatment.

Linimentum camphoræ (camphor liniment), C. P. Guthrie (*North Dakota Sta. Spec. Bul., 3 (1914), No. 6, pp. 83–85*).—No difference in the camphor content was noted whether the camphor was dissolved in cold cotton-seed oil or with the aid of gentle heat under the water bath. It is possible, however, to dissipate some of the camphor if a gentle heat is not employed.

A Halphen test was made on all samples obtained in the open market (37 in all) and five did not give the reaction, one of which was soap liniment, and the remainder gave refractive indexes lower than that of a sample of pure cotton-seed oil. Control samples of camphorated oil, made strictly according to the U. S. Pharmacopœia, gave readings of 1.4708 at 25° C., which compares well with that of pure cotton-seed oil, i. e., 1.4710. Pure olive oil gave a refractometric reading of 1.4672 at 25°. From this it would seem that the four samples mentioned above contained olive oil.

The percentage of camphor present in the samples collected on the market varied from 2.56 to 25.9, with an average of 16.99 per cent. The U. S. Pharmacopœia camphor liniment is essentially a 20 per cent solution of camphor in cotton-seed oil.

The method used for determining camphor in camphor liniment is as follows: "Weigh out accurately about 5 gm. of the sample in an aluminum evaporating dish and heat in the water oven until all camphor is driven off. This may be determined by the odor and by frequent weighings. Between 10 and 11 hours

are required to drive off all the camphor from a 5 gm. sample using an evaporating dish of 2½ in. diameter."

In the samples prepared in the laboratory, only 96 per cent on the average of camphor could be recovered. Oil heated for 11½ hours under certain conditions increased 0.91 per cent in weight. This fact should be considered when interpreting camphor liniment analysis.

The disinfection of anthrax hides, G. ABT (*Bul. Soc. Encour. Indus. Nat. [Paris], 120 (1913), No. 2, pp. 248–289*).—This is a report of studies of the relative value of the Seymour-Jones method, consisting of the use of bichlorid of mercury and formic acid, and the Schattenfroh and Kohnstein method, in which hydrochloric acid is employed, in destroying anthrax spores in hides and the effect of these disinfectants on the value of the hides.

Both methods are found to possess merit. The Seymour-Jones method appears to be somewhat more economical, while the Schattenfroh and Kohnstein method seems to be more effective in disinfecting suspected hides.

A bibliography of 49 titles is appended.

Experimental sterilization of anthrax spores, G. ABT (*Ann. Inst. Pasteur, 28 (1914), No. 2, pp. 149–180*).—In continuing his studies the author has investigated the resistance of spores at 100° C., the neutralization of corrosive sublimate, the antiseptic power of corrosive sublimate in the presence of acid and of protein, the action of chlorin in the presence of protein, etc. A bibliography is included.

A preliminary report of experiments on the cultivation of the virus of rinderpest in vitro, W. H. BOYNTON (*Philippine Jour. Sci., Sect. B, 9 (1914), No. 1, pp. 39–44*).—"From the results obtained from various experiments it is evident that the virus of rinderpest requires either partial or complete anaerobic conditions for its existence. The virus of rinderpest has been carried in virulent form in two separate series up to the sixth transfer in glucose-blood culture media, covering periods of 19 and 21 days, respectively. In one series the medium first inoculated was nonvirulent at the end of 12 days, while the fourth transfer from this tube of culture medium after the same period of time was virulent.

"Results obtained from numerous experiments indicate that fresh blood from nonimmune cattle as a main constituent and glucose as an addition are essential components of the culture media."

An atypical case of rinderpest in a carabao, W. H. BOYNTON (*Philippine Jour. Sci., Sect. B, 9 (1914), No. 1, pp. 45–47, fig. 1*).—"From the facts of this case the evidence is conclusive that an animal may experience a fatal attack of rinderpest without the occurrence of a rise in temperature. The blood of a carabao was shown to be infected within 48 hours after it was originally injected with virulent blood. It was shown that the blood was virulent on the eleventh day when injected into a susceptible animal, yet exposure to the same animal from which blood was drawn did not cause rinderpest in the exposed susceptible animal.

"With regard to the three animals which failed to contract rinderpest by exposure, the question is raised as to whether rinderpest spreads by contact readily in the later stages of the disease or whether the disease must necessarily be accompanied by a rise of temperature before it can be spread by contact."

Experiments upon the transmission of rinderpest, A. R. WARD, F. W. WOOD, and W. H. BOYNTON (*Philippine Jour. Sci., Sect. B, 9 (1914), No. 1, pp. 49–79, pls. 2, figs. 6*).—"Rinderpest virus was not shown to have survived beyond 24 hours in corrals bare of vegetation but containing water. The conditions under which tests were made included all seasons of the year with ac-

companying variations in sunlight, rain, and condition of the soil. The amount of shade varied widely. Animals became infected in such corrals within one-half hour, 12, and 17.5 hours, respectively, after removal of the sick.

"Animals infected with rinderpest were shown to be capable of transmitting the disease to susceptible animals by close contact only during the febrile period of the disease, and most certainly during the period in which the temperature was declining. The disease was not contracted by susceptible animals when exposed to sick animals during the convalescent stage when the temperature was nearly normal.

"Blood of animals infected with rinderpest was shown in two cases to be infected during the height of the febrile period. The virus in urine, diluted with water and sprinkled on grass, was demonstrated to survive for 36 hours in some instances, but not always, and not for a longer period of time. Feces mixed with water and sprinkled on grass infected an animal 24 hours later. Feces and urine diluted with water and kept in a vessel in the shade remained infective for susceptible animals for 36 hours, but no longer.

"No evidence was secured to show that recovered cases transmit the disease. The foregoing facts indicate that the virus of rinderpest perishes soon after being discharged by the infected animal. Nothing in the foregoing experiments indicates that rinderpest virus is harbored for long periods upon the soil of contaminated areas."

Lesions of the nervous system in verminous intoxication, A. RACHMANOW (*Ann. Inst. Pasteur, 28 (1914), No. 2, pp. 181–193, pl. 1, figs. 6; abs. in Amer. Vet. Rev., 45 (1914), No. 3, pp. 269–271*).—The investigations here reported, which were carried on in the laboratory of Weinberg (E. S. R., 30, pp. 278, 784) at the Pasteur Institute, have led to the following conclusions:

"The central nervous system of guinea pigs does not always react to verminous toxins. Lesions of the nervous system are not found in this animal except when it presented more or less serious clinical symptoms during life. Some individuals may absorb considerable quantities of verminous products without presenting the slightest nervous reaction.

"The lesions that are observed in the acute and subacute intoxication are of the nerve-cell, the neuroglia cell, and the fiber of the white substance. Besides the different degrees of chromatolysis, the nerve-cell often presents a large number of sinuous canals hollowed in the whole thickness or in a part of its protoplasm. In severe cases, the nucleus is displaced toward the periphery of the cell and shows a deformed nucleolus. The neurofibrils are preserved in light forms of intoxication, but in severe cases they disappear. The neuroglia cell offers the various stages of the 'amiboid' transformation; it keeps its form, but its nucleus becomes pycnotic, or again it takes the aspect of the amiboid cell of Alzheimer. There is also found, especially in cases of chronic intoxication, an abnormal collection of neuroglic elements about some nerve cells (phenomena of neurophagy). In the same conditions the fibers of the white substance are also altered; they are tumefied, but in an irregular manner.

"The lesions of the brain and spinal cord in verminous anaphylaxy are very small or do not exist, if the guinea pig dies of peracute anaphylactic shock in three to ten minutes. They are, on the contrary, very pronounced if the serious anaphylactic phenomena have lasted for half an hour or longer. They present the same characters in both the subacute or the chronic intoxication. There is nearly always a parallelism between the duration of the grave symptoms and the intensity of the lesion of the nerve-cell.

"The lesions of the central nervous system observed in animals anaphylactized with horse serum are exactly similar to those in animals suffering from

verminous anaphylaxy. As the lesions of the nervous system are much more marked and frequent in the anaphylaxy by worms than in the direct intoxication by the parasitar toxins, it seems probable that the nervous phenomena, sometimes very severe, as for instance the symptoms of meningism, sometimes observed in certain helminth carriers, must be considered as being of anaphylactic nature."

Physiological investigations of the fixation and mode of nutrition of some nematode parasites of the alimentary canal. C. GABIN (*Ann. Univ. Lyon, n. scr., I, No. 34 (1913), pp. 160, figs. 55*).—The parts of this comparative study of the manner in which intestinal nematodes gain their nutrition deal with the technique and methods of work, and a study of the fixation and the mode of nutrition of nematodes of the genera Ascaris and Heterakis, *Oxyurus vermicularis*, *Strongylus strigosus* and *S. retortæformis*, the genera Trichuris and Spiroptera, *Gnathostomum hispidum*, etc.

The studies indicate that the intestinal nematodes find nourishment in the intestinal mucosa of the host and not from the contents of the alimentary canal. The majority of the nematodes are attached to the wall of the alimentary canal either temporarily or in a definitive manner. The nutrition imbibed by the intestinal nematodes from the walls of the alimentary canal of the host differs with the species but may consist of lymph, epithelial cells, erythrocytes, and pus cells.

A bibliography of five pages is appended.

Aerobic micro-organisms in the omasum and colon of bovines, A. W. BUEMANN (*Centbl. Bakt. [etc.], 1. Abt., Orig., 71 (1913), No. 4, pp. 291–319*).—Following a somewhat extensive review of the literature relating to the subject the author reports original investigations and includes descriptions of a number of new species of bacilli. A bibliography of 77 titles is appended.

The treatment of tick bite in stock (*Agr. Gaz. N. S. Wales, 25 (1914), No. 7, p. 569*).—It is stated that a tick, identified as *Ixodes holocyclus*, is very troublesome in New South Wales in late autumn and early spring, proving fatal to calves, dogs, and pigs, and very painful to cows and horses. It is recommended that a laxative be administered as soon as symptoms of paralysis appear, and followed by a tonic.

Spraying for control of ticks in Antigua, P. T. SAUNDERS (*West Indian Bul., 14 (1914), No. 2, pp. 122–125, pl. 1*).—A brief account of work carried on in Antigua.

Some results of blood counting on cattle, A. B. CLAWSON (*Amer. Vet. Rev., 45 (1914), No. 5, pp. 527–536*).—This is a report of studies carried on in connection with work conducted by the Office of Poisonous Plant Investigations of this Department at Limon (altitude 5,360 ft.) and at Mount Carbon (altitude 9,000 ft.), in Colorado. The results are summarized as follows:

In the older animals there was an average of 7,504,400 red corpuscles as compared with 9,159,222 in the younger. The animals when taken from an altitude of 5,360 ft. to an altitude of 9,000 ft. showed an increase in the number of red corpuscles from 8,749,388 to 9,255,878. The counts at the lower elevation, however, were made in early summer, while those at the higher altitude were made largely in midsummer, and had the counts at the two altitudes been made at more nearly the same time the difference might have been greater. The counts at Mount Carbon showed a larger number of red corpuscles in early than in middle or late summer.

Is there a bacillary hog cholera? W. PFEILER (*Mitt. Ver. Deut. Schweinezüchter, 20 (1913), Nos. 6, pp. 111–121; 7, pp. 135–143; abs. in Berlin. Tierärztl. Wchnschr., 29 (1913), No. 47, p. 837*).—After reviewing the history and the

opinions of others relative to the disease caused in young pigs by *Bacillus voldagsen*, the results of some tests are briefly mentioned (E. S. R., 31, p. 87). A positive method for immunizing against the Voldagsen pest has been devised, which consists of administering a vaccine. The disease is prevalent in Germany and probably in Italy and Hungary.

The significance of bacterial infection in hog cholera, R. R. DINWIDDIE (*Arkansas Sta. Bul. 117 (1914), pp. 593–619*).—The author discusses the effect of bacteria (secondary invaders) on the cycle of hog cholera, the effect of the presence or absence in the serum of antibodies to bacterial infection, the significance of *Bacillus suiscpticus*, and related questions, and reports experiments along these lines.

By inoculation tests it has been previously found that virulent strains of *B. suiscpticus* may be present at the base of typical hog cholera ulcers, "and at the same time (by the use of rabbits immunized against this species) the apparent absence of virulent hog cholera bacilli [E. S. R., 22, p. 788]. In order to learn something of the effects attributable to mixed infection and the influence of contagion (bacillar) in producing this condition, post-mortem examination and bacteriologic culture tests have been made as far as possible on all material available during the past two years. This includes experimentally infected animals, pigs artificially infected for serum production, hogs condemned for cholera at the packing plant or city abattoir at Little Rock, and material obtained from outbreaks of hog disease on farms in this State." The material from the serum plant differed from that obtained from farm outbreaks or experimental pens, since these animals (listed as "virus pigs") were often killed several days before death would naturally have occurred; they were also usually infected by strains of cholera virus of which no bacteriologic study had been made.

Out of 40 cases obtained from farm outbreaks, all with one possible exception were hog cholera. *B. suipestifer* was found generally distributed in four animals, although two of these showed no intestinal lesions. In the liver of one animal *B. coli* was present and in another streptococci were found. In three others unidentified nonfermenting bacilli representing three different species were noted, and in three other animals cocci were present. Negative results were obtained in 30 cases. A coccus morphologically resembling the *Micrococcus catarrhalis* was obtained from the engorged spleen of a hog having a marked bilateral pulmonary involvement. "Preparations from the lung showed microscopically numerous organisms of varied species including small bi-polar staining ovals." The animal culture tests for bacilli of the hog cholera group were negative.

Tests made in connection with these experiments showed the infrequency with which bacilli of the hog-cholera type occur in the animals in natural outbreaks of the disease as compared with those artificially infected. The disease which now mostly prevails in Arkansas (termed "Winslow type") is not accompanied by this mixed infection either in animals naturally infected or in those inoculated from them. One experiment indicated that "a generalization of *B. suipestifer* in the body of the animal greatly increases the severity of the disease and aggravates the ante-mortem symptoms although producing no characteristic post-mortem lesions. However, this mixed infection and increased virulence was not transmitted by cohabitation."

From the material obtained from the serum plant "it is shown that of 70 cases examined, *B. suipestifer* was found generalized in 21. Of these 16 had been infected by inoculation (cholera infection), four by exposure, and one without record. Of the animals furnishing the blood for inoculation bacteriologic data are on record for 21. It is seen that in the four cases in which *B.*

suipestifer was present in the animal furnishing the virus for inoculation, this organism appeared also in the inoculated animal as a mixed infection. It occurred four times in animals infected by exposure only, and in all cases (3) which were recorded as having received an intravenous inoculation, also in five of the six hogs which died after serum-simultaneous vaccination. As for the post-mortem lesions present in animals showing this mixed infection it will be seen that there is no uniformity; that is, none which occur only in such cases. Two are recorded as showing only slight lesions. *B. suisepticus* was obtained in one case in which there were no pulmonary lesions reported. In the two cases in which this species was present in the original virus it was not found in the inoculated animal, nor were pulmonary lesions present.

"To obtain more direct evidence of the effect of mixed infection with *B. suipestifer* and hog cholera virus (filterable virus), experiments were carried through in which pigs were infected simultaneously with cholera virus (blood) and with cultures of the bacilli, in comparison with others receiving the blood infection alone. The virus employed was the 'Winslow virus,' which had never been found to give rise to this mixed infection in previous tests. The culture of *B. suipestifer* employed was one which had been grown in the laboratory for 18 months. At the time it was isolated this strain was of less than the usual degree of virulence for guinea pigs. It had not previously been tested on pigs." Some control animals were placed in the pens and seven days after infection showed signs of sickness. In all of these cases when *B. suipestifer* was not fed or inoculated the bacilli were not detected.

This experiment indicated as to mixed infection, (1) a shortening of the incubatory period, (2) a greater severity of the symptoms and more rapid course of the disease, and (3) an absence of any essential and uniform differences in the patho-anatomical changes as seen on dissection. The peculiar form of exudative inflammation with necrosis of the surface epithelium of the large intestine, which occurred in both of the pigs in the pen infected with bacilli by feeding and in one of the pigs infected by inoculation, was present also in an exposure pig which survived for three weeks. "Since this condition quite regularly results from successful infection experiments by ingestion of cultures of *B. suipestifer* alone, we must look upon it as an inflammatory reaction due to the presence of this bacillus."

Although the controls (exposed animals) became sick, *B. suipestifer* could not be detected, and this shows that *B. suipestifer* infection in hog cholera is probably not dependent to any great extent on transference from animal to animal. Any positive assertion on this question, however, must be based on more extensive tests made under varying conditions.

When *B. suipestifer* is introduced artificially, by inoculation or ingestion, in conjunction with the true hog cholera virus a generalized infection with the bacillus usually results. "Since infection with *B. suipestifer* is not known to occur unassociated with true hog cholera infection, except when artificially induced, a complete immunity to the latter virus should indirectly afford protection against the bacillar invasion as well." To what extent the bacillar antibody content in serum may add to the potency of an antihog cholera serum needs still to be investigated. "In the practice of 'serum simultaneous vaccination' accidents arising from this cause are no doubt of occasional occurrence. That they are not frequent may be explained by the facts: (1) That most samples of antiserum contain bacterial antibodies; (2) most samples of virus do not contain bacilli; (3) inoculations of bacillar cultures subcutaneously are often ineffective."

The agglutinins in antihog cholera serum for *B. suipestifer* are assumed to be due mainly to a reaction against the bacilli injected with the blood in hyper-

immunizing or to the invasion of the bacilli from the intestine when these are not present in the injected blood. The serum of hogs treated with a strain of virus which had never been associated with *B. suipestifer* yielded hardly any or no agglutinins for *B. suipestifer*.

From some immunizing tests with *B. suipestifer* it is inferred that it is not essential that an antihog cholera serum intended for simultaneous vaccination should agglutinate *B. suipestifer*, providing the same virus is used for the vaccination as was employed for preparing the serum. "However, the immunity thus acquired, while apparently sufficient to protect against subcutaneous inoculation of small doses of bacilli, seemed to break down under intravenous inoculation of large amounts of bacilli containing blood. . . . It may be mentioned also that most serum hogs which die during treatment (when not due to mechanical overloading of the circulation) show a generalized *B. suipestifer* infection which is suggestive of insufficient preliminary immunization against this bacillus."

Of the associated bacteria found in the filterable virus of hog cholera, next to *B. suipestifer* is the colon bacillus. A coccus which is described as morphologically resembling *M. catarrhalis* was found in the spleen, liver, and blood in several cases of hog cholera. This organism grows feebly upon ordinary media and its cultures were nonpathogenic for guinea pigs. *B. pyocyaneus* was noted occasionally in the pulmonary lesions of hog cholera, but more frequently in the large local lesions which followed inoculation. *B. suisepticus* was found very infrequently, and in all except one case it was associated with marked pulmonary involvement in pneumonia and pleurisy. A variety of organisms were noted occasionally in the culture tubes.

Of the many cultures obtained from organisms in cholera hogs giving a fermentation reaction, which was regarded as presumptive evidence of *B. suipestifer*, a number were given a study relative to their fermentative behavior toward various carbohydrates (dextrose, galactose, maltose, and mannit). All of the organisms studied gave the general cultural reactions ascribed to the hog cholera or *B. enteritidis* subdivision of the colon group of bacilli.

"The one feature in which these strains showed a considerable variation was in the production of indol in Dunham's peptone solution after one week's incubation. According to the text-books indol production in peptone solution is not a feature belonging to this species, although it may occasionally occur."

From the agglutination tests with antiserum it is concluded that "the view which some have entertained, that the bacilli which have been so generally cultivated from the organs of cholera diseased hogs and described as *B. suipestifer* or *B. choleræsuis* really include a variety of organisms presenting on closer study differences in cultural characteristics, is not supported by this investigation where all the strains studied are practically identical in cultural and biologic characters. . . . It seems therefore that cultures from the organs of cholera diseased hogs giving the fermentation tube reaction which we have called presumptive evidence of *B. suipestifer* are probably always this species. It is of interest that this same fermentation tube reaction has occasionally been found in city water tests here but never further investigated. . . . Swine plague as an independent disease has not been met with during this investigation."

Hog cholera in Montana, W. J. Taylor (*Montana Sta. Circ. 33 (1913), pp. 153–165, figs. 7*).—This deals in a popular way with the extent of the hog raising industry and hog cholera in Montana. It discusses how hog cholera is spread, the symptoms and the post-mortem changes in the disease, methods for controlling hog cholera, disposition of dead carcasses, disinfectants and disinfection, hog cholera vaccine, and methods of vaccinating against hog cholera.

The occurrence of avian tuberculosis in hogs, M. JUNACK (*Ztschr. Fleisch u. Milchhyg., 23 (1913), No. 20, pp. 457–461*).—Of 15,000 hogs slaughtered at the abattoir at Kottbus, Germany, 2 per cent were found to have caseated areas in the mesenteric lymph glands, and in 25 per cent of the animals actually found tubercular on inspection the same condition was noted. Many of the latter animals also showed caseated areas in the lymphatic nodules of the large intestine which were of a granular, crumbling consistency.

The lymph glands of 32 cases were examined microscopically and acid-fast bacilli could be noted in 31 cases in a very short time by the Ziehl-Neelsen method. There was nothing typical about these organisms. In four instances the caseated areas of other organs were examined, and although the organisms were easily detected, they were not acid fast.

Further investigations were made at the Berlin abattoir and out of 200 hogs 7 showed the caseated areas, but the seventh animal was also affected with local mesenteric anthrax. In all 7 instances acid-fast bacilli could be noted in smears within 40 seconds. The caseous material from 5 of the cases which included the anthrax hog was injected into guinea pigs, which after 7 to 16 weeks showed no visible changes in those lymphatic glands which could be palpated in the living animal. The animals are to be kept under further observation.

From the caseous area of the hog affected with local anthrax the avian type of tubercle bacillus was isolated. Cultures were also made in glycerin and agar media and on glycerin-potato. In all three instances the agar-glycerin medium remained sterile but with the potato a growth was obtained. The organisms from the potato were found to be acid fast, and their biology will be the subject of further study.

The confusing of swine plague with tuberculosis in hogs is also discussed.

Mammary gland tuberculosis in a mare, LEIBENGER (*München. Tierärztl. Wchnschr., 56 (1912), No. 44, p. 786; abs. in Centbl. Bakt. [etc.], 1. Abt., Ref., 56 (1913), No. 7, p. 201*).—A description of a case in a 4-year-old mare affected with generalized tuberculosis.

The etiology of infectious abortion of mares, B. B. LAUTENBACH (*Centbl. Bakt. [etc.], 1. Abt., Orig., 71 (1913), No. 5–7, pp. 349–377*).—The author's bacteriological and complement fixation investigations and animal experiments led to the conclusion that the infectious abortion of mares is caused by *Bacillus* D, which has been found by agglutination to belong to the group of hog cholera bacilli and is placed near *B. paratyphosus* A. The paper includes a review of the literature.

On the diagnosis of infection with Bacterium pullorum in the domestic fowl, G. E. GAGE ET AL. (*Massachusetts Sta. Bul. 148 (1914), pp. 20, pls. 5*).—Experiments conducted with the view of determining whether the diagnosis of *B. pullorum* infection by testing the eggs of suspected hens is a practical method led to the conclusion that while positive results may be obtained the elimination from the ovary is so irregular the method would be impractical for rapid diagnosis. Preliminary incubation of the eggs in a bacteriological incubator at 38 to 39° C. prior to testing was found to aid in detecting the organism.

The macroscopic agglutination test proved to be a good laboratory method for the detection of adult hens that are harboring, or have harbored, *B. pullorum*. The work is said to substantiate that of Jones (E. S. R., 28, p. 887) in that it is possible to cause a local infection of the ovarian tissue by intravenous injections of pure cultures of *B. pullorum*.

"The agglutinin is very stable, withstanding temperatures of 60° and over for one-half hour. If properly preserved, it will yield results after two weeks. Agglutinins have been found from infected hens which reacted positively in

dilutions from 1:100 to 1:5,000. Polyvalent test fluids yield more uniform results than monovalent fluids, although in birds of marked infection monovalent test fluids gave very good results. Test fluids, if properly preserved on ice, will keep in a very active state for more than two months.

"Rabbits reacted to injections with pure cultures of *B. pullorum*, but by careful immunization yield very active agglutinins and also bacteriolytic sera. Agglutinins produced by immunizing rabbits are much more stable than those from hens harboring the organism.

"A striking pathological condition found in the ovaries of all birds was the exhibition of lobulated and retention cysts which varied greatly in size. From these it was usually easy to isolate *B. pullorum*."

RURAL ENGINEERING.

Irrigation practice in Montana, H. B. BONEBRIGHT (*Montana Sta. Circ., 29 (1913), pp. 25–72, figs. 32*).—This circular gives in popular language a compilation of detailed information regarding irrigation practice in Montana and related subjects which are of interest to the irrigation farmer.

Annual irrigation revenue report of the Government of Bengal (*Ann. Irrig. Rev. Rpt. Bengal, 1912–13, pp. 76*).—The physical and financial conditions of the irrigated districts of the Province are reported.

Report of the board of state engineers (*Rpl. Bd. State Engin. La., 1912–1914, pp. 172, pl. 1*).—This report deals with drainage reclamation in the State and also with highways, highway bridges, and other State engineering work. A large part of the data as to drainage by levee districts has been previously reported in publications of this Department (E. S. R., 31, p. 185).

Some fundamental engineering features in the drainage of arid soils, R. A. HART (*Iowa Engineer, 14 (1914), No. 8, pp. 308–317*).—The author deals chiefly with the drainage of irrigated soils, discussing the main features of such work and pointing out the difference between the drainage of arid and of humid soils. It is stated in conclusion that arid soils containing less than 0.2 per cent of alkali salts need little consideration, but that soils containing over 0.4 per cent of salts, by weight of the soil, need drainage.

Report upon the Black and Boggy Swamps drainage district, Hampton and Jasper Counties, S. C., F. G. EASON (*U. S. Dept. Agr. Bul. 114 (1914), pp. 21, figs. 3*).—This report describes the district and the proposed drainage plan and briefly discusses the problems involved.

The district is approximately a rectangle, 12 miles long northwest and southeast, and 9 miles wide. The north, east, and west boundaries are formed by natural watershed lines, with no natural boundary on the south. The general slope of the ground is southward toward the coast and westward toward the Savannah River, which is the outlet for all the drainage of the district. The two main drainage channels for the district are Boggy Swamp, serving the northern and western parts, and Black Swamp, serving the eastern part. The poor drainage conditions are attributed to (1) lack of suitable drainage connection between the wet, flat areas and the drainage channels, and (2) the inability of the drainage channels to remove the water after it has reached them. The predominating and most generally cultivated type of soil of the district is a light sandy loam underlain by a reddish to yellow clay at depths of 4 to 18 in. Other soils are a tenacious gray clay, a red clay, and a heavy black muck.

The complete plan recommended for reclaiming the lands of the district involves the construction of 68 miles of dredged ditches and 98 miles of hand-made ditches. The minimum dredged ditch is one with a 14-ft. bottom width,

7-ft. depth, and ½ : 1 slide slopes, while the handmade ditches usually have 3-ft. bottom widths, 5-ft. depths, and ½ : 1 side slopes. A berm of 8 ft. is recommended for the dredged channels, and of 3 ft. for the handmade ditches. The width of right of way varies as follows: For 3-ft. ditch, 30 ft.; for 14-ft. ditch, 80 ft.; for 16 to 20-ft. ditch, 90 ft.; for 22-ft. ditch, 100 ft.; and for 28 to 30-ft. ditch, 120 ft.

The proposed improvement in Boggy Swamp consists of a ditch throughout the length of the swamp, 13,000 ft. of which is handmade, with 3-ft. bottom width, 6-ft. depth, and side slopes ½ : 1; and 62,800 ft. of dredged ditch increasing from minimum size to a bottom width of 30 ft. at the lower end. The proposed improvements on Black Swamp consist of a corresponding dredged ditch about 10 miles long with bottom width varying from 13 ft. to 30 ft. Numerous tributaries to both these ditches comprise several miles of both handmade and minimum dredged ditches, as do also several small improvements in independent watersheds.

An estimate of the cost shows the total for the drainage district to be $371,598, or an average cost per acre of $5.50.

Mole-draining and the renovation of old pipe drains, D. T. THRING (*Jour. Roy. Agr. Soc. England, 74 (1913), pp. 76–89, figs. 10*).—The process of mole-draining water-logged soils is described and illustrated. Mole-draining is the making of a long hole, from 3 to 4 in. in diameter, under the surface of the land at varying intervals, and at depths from 3 ft. to 18 in., without digging and without pipes. The draining tool consists of a 3½ in. round steel plug sharp at one end and firmly secured to a steel blade 8 in. wide. A hole is dug to the required depth and the tool dropped into the ground and drawn up the field, thus cutting the earth with the blade to the depth of the plug and leaving a round hole in the clay.

The best results are said to be obtained on a heavy clay soil and the method is useless unless the subsoil is clay. If old tile drains are already installed the mole-drains may be connected with these where the two intersect. The distance apart of mole-drains is governed by the furrows, but where there are no furrows they should be from 5 to 9 yds. apart. The depth of drains is governed by the soil. On very retentive soils 18 to 21 in. is deep enough, while on lighter clay 24 to 27 in. is better. Cost data applicable to English conditions are given, covering the entire process.

Experiences with wood-stave pipe, E. M. CHANDLER (*Engin. Rec., 69 (1914), No. 11, p. 299*).—Information on the use of wood-stave pipe is given as follows:

For pressure heads between 20 and 150 ft. there seems to be no better type than wood-stave pipe built of redwood or fir. Steel pipe is preferable for pressures above 150 ft. on account of the necessarily close spacing of the steel bands on the wooden pipe for high heads. Wood-stave pipe without a preservative coating buried in a dry volcanic ash soil and not under hydraulic pressure continuously is subject to rapid decay.

Treatment of wood-stave pipe with hot carbolineum is concluded to be beneficial. One of the great advantages of having the pipe above ground is the ease of detecting leaks. Draining of the pipes during freezing weather, if they are promptly refilled afterward, can not increase the rate of decay.

Experience with a machine-banded wood-stave pipe showed that if it were necessary to bury it in arid regions, every precaution should be taken to coat all parts with a proper preservative.

Country road construction, A. LIEBMANN (*Der Landstrassenbau. Berlin and Leipsic, 1913, pp. 147, figs. 44*).—This book deals with the technical side of road design, construction, and maintenance from the viewpoint of the German

engineer. An introductory section dealing with the generalities of the subject, including a historical review, is followed by a discussion of vehicles and a mathematical analysis of the reciprocal effects of vehicles and roads. A section on location, design, and construction discusses alignment, cross section shape and structure, surface and underdrainage, foundations, surfacing, and costs. A final section deals with maintenance, including cleaning, rolling, dust prevention, and costs.

Progress reports of experiments in dust prevention and road preservation, 1913 (*U. S. Dept. Agr. Bul. 105 (1914), pp. 46*).—This report covers the completion of experimental work begun in 1912 (E. S. R., 29, p. 590) and gives the details of construction of several new sample roads.

An inspection of the experimental roads at Chevy Chase, Md., most of which have been previously described, showed the bituminous concretes to be in excellent condition. The section laid under the Topeka specification had a slightly wavy surface as compared with the District of Columbia pavement and had compressed in a few places below the top of the adjoining curb. The seal coat on the District of Columbia pavement began to bleed badly with the advent of warm weather. The results of expansion in concrete during hot weather were noted at the joint between experiments 2 and 3, where the roadway buckled across its entire width and to a small extent sheared off some of the concrete base of the District of Columbia pavement.

An inspection of the several bituminous surface treatments applied to concrete did not seem to indicate any noticeable difference between the adaptability of cement concrete and oil-cement concrete to this form of treatment. Practically all of the sections with bituminous surfaces suffered to a greater or less extent from the passage of a traction engine. The exposed concrete surface, as a whole, presenting a smooth, uniform texture and there was apparently no difference in wear between the plain cement and oil-cement concrete. The addition of a hydrated lime had no noticeable effect on the concrete. Cracks devloped at a greater average distance where a limestone aggregate was used.

No difference was noted in the character of the various sections of brick pavement. The grouted surface had practically all worn off, and at a few places throughout the length of the section small transverse cracks had developed where the grout had broken loose from a course of brick.

On Rockville Pike, Md., experiments were conducted with tars and oils applied on surfaces hot and cold to demonstrate the relative value of several bituminous products and to ascertain the relative economy, from a maintenance standpoint, of cold treatment with the lighter products as compared with hot treatments with some of the heavier products. In these experiments refined coal tar, refined water-gas tar, asphaltic petroleum, residual asphaltic petroleum, and water-gas tar preparations were used. These were applied to surfaces finished as water bound macadam and covered with trap rock screenings or gravel. An inspection of these experiments showed that trap rock and gravel coverings have given equally good results. The surfaces were, in general, smooth and firm throughout.

At Miami, Fla., experiments were conducted with oils and coralline rock. The oils were applied to the rock subsurface by the semipenetration surface treatment and the penetration methods, using cold, light oil and hot, heavy oil. An inspection of these experiments showed two of the sections to be in very bad condition and demonstrated the impracticability of treating the original coralline rock roadway either by attempted penetration or strictly surface application of bitumen. The other experiments were in fair condition.

Supplementary reports are also given of experiments made at Washington, D. C., on surface treatment by tar preparation and oils; at Chevy Chase, Md., on bituminous construction, surface treatment, and the use of refined semiasphaltic oil; at Jamaica, N. Y., on the use of oil-cement concrete, oil asphalt, tar, and fluxed native asphalt; at New York, N. Y., and Ridgewood, N. J., on oil-cement concrete; at Boise, Idaho, on oil-gravel macadam; at Ames, Iowa, on oil-asphalt gravel; at Knoxville, Tenn., on tar and oil preparations; at Youngstown, Ohio, on slag, slag and lime, slag and waste sulphite liquor preparation, and slag and tar; at Newton, Mass., on asphaltic preparations, tar preparations, residual oil, and molasses-oil-lime; at Garden City, Dodge City, Bucklin, and Ford, Kans., on sand clay; at Independence, Kans., on oil-asphalt earth road; and at Bowling Green, Ky., on Kentucky rock asphalt.

Standard abrasion test for gravel employed by the Ohio State Highway Department, A. S. Rea (*Good Roads, n. scr., 7 (1914), No. 23, pp. 315, 316, fig. 1*).—In an attempt to obtain a satisfactory test for gravel which would give a measure of its resistance to wear when subjected to traffic conditions, the standard abrasion test for stone was modified, using the Deval type of abrasion machine and 6 cast-iron spheres such as are used in the standard paving-brick rattler test per cylinder for an abrasive charge. The gravel was screened through screens having 2-in., 1-in., and ½-in. circular openings, and the sizes used for the tests were equally divided between those passing the 2-in. and retained on the 1-in. screen, and those passing the 1-in. and retained on the ½-in. screen. The duration of the test and the rate of rotation were 10,000 revolutions at the rate of from 30 to 33 revolutions per minute.

A series of tests made to compare the results obtained with those from the standard stone test show the advantage of this test, aside from the consideration of the size of material, to be in the increased severity of the abrasion on the soft, friable sandstone pebbles and material of a similar nature. "In this test the impact of the cast-iron spheres breaks up the soft pebbles, while in the stone test the impact of the stone on stone tends merely to round off the corners and edges."

Test of wire-cut and re-pressed paving brick (*Engin. Rec., 69 (1914), No. 22, p. 607, figs. 4*).—Experiments to compare the penetration of grout for re-pressed paving brick with horizontal grooves in the end faces and for wire-cut brick with double beveled or bulging ends showed that the penetrations were equally satisfactory, but that the wire-cut samples formed a stronger bond with the grout.

Effect of hydrated lime on change in volume and strength of mortars and concretes, H. S. Spackman (*Nat. Lime Manfrs. Assoc. Bul. 10 (1914), pp. 24, figs. 9; Concrete-Cement Age, 4 (1914), No 3, pp. 112–116, figs. 9*).—The results of tests on the effect of different conditions of exposure with and without the addition of hydrated lime on the change in volume of Portland cement mortar and concrete and on their tensile and compressive strengths are reported.

Variation in moisture content affected the volume of the test piece more than change in temperature. When kept from contact with water other than atmospheric moisture there was a marked tendency to shrinkage of the test piece, which continued up to and beyond the 6-month period. Where the test piece was in constant or frequent contact with water it tended to expand in volume. With the draining off of excess gaging water there was a marked shrinkage at the 24-hour period, followed in some cases by expansion at 48 hours and further shrinkage if test specimens were out of contact with water and expansion if in contact with water. The addition of hydrated lime, while increasing somewhat the maximum expansion and contraction when the test

specimens were constantly exposed either to water or dry air, markedly reduced the shrinkage due to the draining off of the surplus gaging water and also the extent of the movement when the test piece was ultimately wet and dried.

Portland cement mortars and concrete either with or without the addition of hydrated lime developed the greatest strength when in continuous contact with water, and when allowed to harden in air without water there was a marked diminution of strength. Considered broadly, the addition or substitution of 10 per cent of hydrated lime had no marked effect on the strength of the mortars.

It is concluded that the addition of hydrated lime will be found advantageous under ordinary climatic conditions, not only in concrete road construction but in concrete work generally.

Power from the sun, F. SHUMAN (*Engin. Mag., 47 (1914), No. 3, pp. 419–423, fig. 1*).—A description is given of the main features of construction and operation of the sun-power plant for irrigation pumping at Cairo, Egypt.

The engine used is a special low-pressure engine previously described (E. S. R., 29, p. 787). The steam is generated in the sun heat absorbers which are approximate parabolic troughs for catching the sun's rays and concentrating them upon the boiler swung at the focal point. Tests of the steam-producing capacity of the heater showed the average production to be 1,100 lbs. per hour of 15 lbs. steam (absolute pressure) for a 10-hour day, giving on an average 50 brake horsepower. A comparison of the cost of erection in that locality of this plant with that of a coal-burning plant of equal horsepower showed a total saving in cost of erection and operation in favor of the sun-power plant of £410 6s. (about $2,000). The plant is said to have a thermal efficiency of 57 per cent.

Gas-engine indicator diagrams, G. W. MUENCH (*Power, 39 (1914), No. 22, p. 775, figs. 8*).—Seven actual indicator diagrams taken on gas engines are given and compared with a normal diagram from a four-stroke cycle engine, thus showing how some of the common gas-engine troubles, such as improper timing of valves and ignition, preignition, faulty compression, excessive back pressure, etc., may be detected by the indicator diagram.

Strength of shafting required to transmit a given horsepower at different speeds, C. H. CLARK (*Sci. Amer. Sup., 77 (1914), No. 2003, p. 331, fig. 1*).—Formulas and a diagram are given for computing the size and strength of shafting required to transmit a given horsepower at different speeds.

Transmission of power by Manila rope, R. TRAUTSCHOLD (*Power, 39 (1914), No. 19, pp. 666–670, figs. 9*).—Charts and formulas for figuring the power transmitted by rope drive, the sizes of sheaves, etc., are given, and the characteristics and advantages of rope drive are discussed.

The implements of the industry, H. P. AGEE (*Hawaiian Sugar Planters' Sta., Agr. and Chem. Bul. 44 (1914), pp. 84, figs. 74*).—This is a compilation of information regarding a number of the methods and implements used in the cultivation of sugar cane in Hawaii.

Permanent farm buildings, J. B. DAVIDSON (*Brick and Clay Rec., 44 (1914), No. 10, pp. 1140–1143, figs. 9*).—The author draws attention to the economic importance of permanent construction of farm buildings, points out in a general way the requirements for such construction, and advocates particularly the use of clay products as building material.

Transmission of heat through building materials, F. L. BUSEY (*Power, 39 (1914), No. 16, pp. 572–574, fig. 1*).—In the interests of both building heating and refrigeration the author analyzes mathematical methods and gives tables of data for computing the heat transmission and the transmission resistance of different building materials.

RURAL ECONOMICS.

Farm management in the Gallatin Valley, E. L. CURRIER (*Montana Sta. Bul. 97 (1914), pp. 103–120, figs. 4*).—In a survey of 50 farms, the author found that the average labor income on the 25 better farms was $1,365.92 while on the 25 poorer farms there was a loss of $361.92, the farmers on these farms not receiving 6 per cent interest on their farm investment. Among the conclusions reached by the author in making a comparison of these two types of farms are that the better farms were stock and grain farms while the majority of the poorer farms produced only grain. The most successful farms averaged over four important sources of income while the poorer farms averaged slightly over two. The crop yields of the better farms averaged 22.8 per cent larger than the poorer, due to a more efficient system of soil management through greater diversification. The better farms had 8.6 acres per animal unit to 11.9 acres on the poorer farms, and had more dairy cows and sheep. The better farms produced a net return of $2.41 per dollar of labor while the poorer farms produced only 49 cts.

Profits in farming on irrigated areas in Utah Lake Valley, E. H. THOMSON and H. M. DIXON (*U. S. Dept. Agr. Bul. 117 (1914), pp. 21, figs. 7*).—In this study 95 farms near Provo and Spanish Fork were used as a basis.

Among the results shown were that the greater part of the farm receipts were from sugar beets. The growing of other crops such as small fruits and vegetables which are suited to intensive agriculture was seriously limited by market conditions.

The total labor expense constituted nearly 50 per cent of the total farm expenses. The average labor income on 35 small farms with 16.5 acres in crops was $247; on 30 general fruit and sugar-beet farms with 42 crop acres the labor income was $589; and on 4 grain and live-stock farms with 74 crop acres the labor income was $620. The profits received were largely influenced by the size of the farm business, the type of farming followed, and the diversity of the income. Many of the farms were so small in magnitude of business that the owners could not possibly make a comfortable living without outside employment. Of the 54 farmers who had less than 40 acres, only 2 men made over $1,000 labor income, and more than 60 per cent of them made less than $300. The high initial cost of land plus the cost of water rights and cost of improvements all combine to make such a heavy investment that intensive agriculture becomes almost imperative, even though such a form is wholly unsuited in its market relations. In most successful forms of intensive agriculture diversification of enterprises is important, and the limited markets in this region were in this way a severe handicap to the most efficient farm organization.

The management of farms growing sugar beets in Austria-Hungary, E. C. SEDLMAYR (*Mitt. Landw. Lehrkanz. K. K. Hochsch. Bodenkul. Wien, 2 (1914), No. 3, pp. 487–556*).—The author gives detailed information showing the areas devoted to the different farm purposes, rotations followed, kinds and amount of fertilizers used, number and kinds of agricultural implements owned, average yield of the principal farm crops, number of live stock kept, and the wages paid for male and female laborers at different seasons of the year.

The determination of the cost of production, C. S. ORWIN (*Jour. Bd. Agr. [London], 21 (1914), No. 3, pp. 193–201*).—The author asserts that since farm accounting is in its initial stages it would be easier to develop uniformity in methods than later when different systems have become accepted. He concludes from his study of the present systems that it is not possible to determine the cost of any one farm commodity without a complete calculation of the cost of all the produce of the farm.

The county farm bureau, B. H. CROCHERON (*California Sta. Circ. 118 (1914), pp. 18, figs. 9*).—The author discusses the functions of the farm bureau, a county organization of those interested in agriculture "to assist the farm adviser in his work in the county," outlines the method of organization, and gives a constitution and by-laws previously noted (E. S. R., 30, p. 695).

Community improvement clubs for the rural and village communities of Kentucky, C. D. BOHANNAN (*Kentucky Sta. Ext. Circ. 19 (1914), pp. 31*).—This contains a model constitution for a rural community improvement club and suggestions for making a study of a rural community along the lines of health and sanitation, and economic, social, religious, and school conditions. These suggestions are in the form of questions the answers to which the community is to determine for itself. A brief bibliography is included.

Economic associations of rural Poland, A. SZEMBEK (*Les Associations Économiques des Paysans Polonais Sous la Domination Prussienne. Paris and Brussels [1914], pp. XVI+461*).—This book contains a detailed statement of the history and organization of mutual credit societies, cooperative associations, and agricultural clubs in Poland, and their relation to their respective central organizations. A brief bibliography is included.

Buyers and sellers in the cotton trade, H. B. HEYLIN (*London, 1913, pp. VIII+234, pl. 1*).—This book describes the cotton trade, the sources of supply, the progress of cotton manufacture in England, and various phases of the distribution of cotton and cotton goods. Statistical data are given showing the production, consumption, trade, and prices for a series of years.

Second annual report of the markets commissioner of the Province of British Columbia, J. F. SMITH (*Ann. Rpt. Markets Comr. Brit. Columbia, 2 (1913), pp. 31*).—This report contains a summary of the work of the markets commissioner during 1913, and gives information regarding the consumption of fruit at prairie centers, freight rates, prices, cost of production, and rules regarding grades.

Stability of farm operators, or term of occupancy of farms (*Bur. of the Census [U. S.] Bul., Agr. U. S., 1910, Stability of Farm Operators, pp. 22*).—In taking the last census of agriculture, the question was asked, "How long have you lived on this farm?" These data have been tabulated by number of years of occupancy and by color and tenure of farmers, and may be summarized as follows:

Farm operators in the United States classified by number of years on farm and by tenure, 1910.

Number of years on farm.	Total number of operators.	Owners, free.	Owners, mortgaged.	Part owners.	Cash tenants.	Share tenants.	Managers.
Total number of farmers	6,361,502	2,295,277	1,059,620	593,825	826,287	1,528,389	58,104
Farms reporting	5,794,768	2,005,514	947,487	557,867	779,265	1,451,294	53,341
Total years	48,539,605	28,056,981	8,723,591	4,823,483	2,950,917	3,746,385	238,248
Less than 1 year	1,000,293	98,307	93,765	50,568	203,275	541,018	13,360
1 year	627,860	99,895	86,711	50,281	124,570	257,859	8,544
2 to 4 years	1,371,607	334,277	222,510	138,894	248,632	412,119	15,175
5 to 9 years	992,468	379,561	209,971	126,855	117,161	150,554	8,366
10 years and over	1,802,540	1,093,474	334,530	191,269	85,627	89,744	7,896
Not reported	566,734	289,763	112,133	35,958	47,022	77,095	4,763

Persons engaged in agriculture, W. E. BEAR (*Trans. Highland and Agr. Soc. Scot., 5. ser., 26 (1914), pp. 233–245*).—The author by the use of the census data as a basis estimates that the decreases in persons engaged in agriculture in the United Kingdom were 4.6 per cent for males and 19 per cent for females in the decade ended 1891, while the corresponding decreases for the 10 years ended

1901 were 10.24 and 27.96 per cent. For the 10 years ended 1911 there were increases of 1.11 and 0.23 per cent, respectively. During the last 10 years this increase has taken place principally in England, while there has been a decrease in Scotland and Ireland. The English increase is due to the multiplication of small holders, while the Scottish decrease is due in part to a more precise distinction between farmers and crofters in 1911. In Ireland the decrease is due to the consolidation of farms.

Rural population in England and Wales: a study of the changes of density, occupations, and ages, A. L. BOWLEY (*Jour. Roy. Statis. Soc., 77 (1914), No. 6, pp. 597–652, figs. 2*).—Among the conclusions reached by the author are that the population in purely rural areas is not completely dominated by the number in agricultural occupations. The number of farmers has changed very little in 50 years, but the number in the horticultural and market gardening occupations has increased slightly. A large number have throughout the last 50 years started their working life in agriculture and subsequently moved to other occupations in the country, in the towns, or abroad. At present 17 years seems to be the critical age. There is no evident connection between the numbers of agricultural laborers or the changes in their numbers, on the one hand, and the changes of wages, heights of wages, density of population, or the movement of other parts of the rural population on the other hand.

Agricultural population of Sweden, L. WIDELL (*Statis. Årsbok Sverige, 1914, p. 13*).—A classification of the population of Sweden according to the professions in which they are engaged, and including those who are dependent upon them for support, indicates that in 1870 71.87 per cent were engaged in agriculture, in 1880 67.42 per cent, in 1890 60.92 per cent, and in 1900 53.67 per cent. The total population has increased during this period from 4,168,525 to 5,136,441.

Agricultural statistics of Sweden, L. WIDELL (*Statis. Årsbok Sverige, 1914, pp. 50–62*).—This annual report gives statistics showing for 1911, by departments, the area devoted to different agricultural purposes, area and yields of the principal farm crops, and the number of farm animals, with data for earlier years. Additional data are given concerning the dairy industry and forests.

The agriculture in the Netherlands (*Pubs. Roy. Netherland Agr. Soc., No. 10 (1914), pp. 140, pl. 1, figs. 20*).—This pamphlet, written in English, contains the following papers: Some Particulars about Dutch Agriculture, by F. B. Lohnis; Cattle Breeding in the Netherlands, by C. Broekema; Dairy Produce in the Netherlands, by V. R. Y. Croesen; Reclamation of the Heaths in the Netherlands, by J. P. van Lonkhuyzen; State Efforts on Behalf of Agriculture in the Netherlands; and The Activity of Farmers' and Market Gardeners' Associations in the Netherlands, by V. R. Y. Croesen and R. P. Bonthuis.

AGRICULTURAL EDUCATION.

Agricultural instruction and its methods, P. DE VUYST (*L'Enseignement Agricole et ses Methodes. Brussels, 1913, 2. ed., pp. XII+354*).—This is the second edition of this book, which has been previously noted (E. S. R., 21, p. 190).

Status of agricultural instruction (*Rap. Trien. Min. Agr. et Trav. Pub. [Belgium], 1909–1911, pp. XXVI+330*).—This report for the years 1909–1911, inclusive, submitted by the minister of agriculture and public works to the legislative chambers of Belgium, on the collegiate, secondary, elementary, and extension instruction in agriculture, horticulture, and home economics, gives detailed information concerning the faculty, curriculum, attendance, examinations, etc., of the individual institutions.

The organization of agriculture by the department of agriculture in Ireland and its application to the conditions of the Bombay Presidency, W. W. SMART (*Agr. Jour. India, 9 (1914), No. 1, pp. 23–37*).—In this paper, read at the Provincial Agricultural Conference held at Poona in September, 1913, the acting director of agriculture of the Bombay Presidency describes the work of the agricultural branch of the Department of Agriculture and Technical Instruction for Ireland in its cooperation with the 33 county councils and the scheme under which the funds for agriculture are administered, and outlines his ideas as to how this system could be adopted in the Bombay Presidency.

Report of the department of agricultural education, W. H. FRENCH (*Ann. Rpt. Sec. Bd. Agr. Mich., 52 (1913), pp. 59–62*).—In this report of the professor of agricultural education of the Michigan College attention is called to the teaching of pedagogical subjects leading to teachers' certificates for 15 hours each week during the year to a class of 105 students and to the teaching of agriculture by graduates of the institution in 20 high schools. The high-school agricultural course is a 4-unit course elected by from 10 to 50 per cent of the boys. Eighteen 1-week courses for farmers were held in connection with the high schools, the attendance ranging from 20 to 150. During the spring the organization of 30 boys' and girls' clubs in connection with rural schools was effected, and a pamphlet of instructions and projects has been distributed. About 150 readers have taken advantage of the college extension reading course.

Schools of agriculture, mechanic arts, and homemaking, L. S. HAWKINS (*Univ. State N. Y. Bul. 543 (1913), pp. 20*).—This bulletin contains a discussion of schools of agriculture as a part of the public school system, qualifications of teachers, rooms and equipment, types of schools of agriculture, mechanic arts, and home making; and an outline of the procedure in organizing them, project work in agriculture and summer work of agricultural teachers, suggested courses in agriculture and home making for intermediate and high schools of agriculture, and a list of general reference books relating to agriculture and rural life.

Agriculture in the high school, L. S. HAWKINS (*Univ. State N. Y. Bul. 563 (1914), pp. 52, pls. 5, figs. 9*).—The author discusses methods of instruction, how to keep a record of pupils' and teachers' work, equipment needed, field trips, pupils' notebooks, recitations, the shop, and the purpose and equipment of the farm mechanics work in the high school. A classified list of agricultural books is given.

The New Hamphire type of reconstructed rural high school, H. A. BROWN (*Vocational Ed., 3 (1914), No. 5, pp. 327–337, figs. 5*).—In this article the author describes the courses in agriculture and home economics which are used in 15 New Hampshire high schools in rural sections in which agriculture is the predominating industry.

State-aided vocational agricultural education (*Ann. Rpt. Bd. Ed. [Mass.], 77 (1912–13), pp. 246–261*).—This report of progress made in vocational training in agriculture shows, that 77 pupils carried on home project work as compared with 69 in 1912, that 30 pupils—5 from each of the 6 centers where agricultural project work and study were in operation in 1913—earned from farm work, in connection with good standing in the class room, $9,728.03, and that the number admitted to such training for the 1914 school year is 266. A working agreement has been made by which each instructor is becoming the local representative of the extension service of the Massachusetts College and of this Department for investigations and advisory work among the farmers in his vicinity. The instructor of the extension service has been appointed state leader. Statistical tables are included.

The Massachusetts home-project plan of vocational agricultural education. R. W. STIMSON (*U. S. Bur. Ed. Bul., No. 8 (1914), pp. 104+III, pls. 6*).—The author discusses the elements necessary to successful vocational agricultural education, describes the Massachusetts home-project plan, and gives (1) information and suggestions for school officers and instructors as to courses and methods of agricultural project study approvable for State aid in Massachusetts, (2) project study outlines for vegetable growing, and (3) an agricultural project study bibliography. An appendix by W. T. Bawden has been previously noted from another source (E. S. R., 30, p. 597).

Report of the extension work with the schools as carried out through the schools' division, S. B. MCCREADY (*Ann. Rpt. Ontario Agr. and Expt. Union, 34 (1912), pp. 46–48*).—About 250 schools shared in the distribution of planting material and instructions for practical work in school or home gardens. A series of charts containing lessons in agriculture was commenced, and numbers on alfalfa and the best time to sow spring grains respectively, have been distributed. An illustration is given of the alfalfa chart.

A school garden in the making, its objects and uses, J. J. CRONIN (*Agr. Jour. India, 9 (1914), No. 1, pp. 71–76*).—The author points out the objects and uses of a school garden and describes the home and school garden work begun in Burma, India, in 1912. There are now ten school gardens in process of formation.

Rhode Island boys' and girls' home gardening clubs (*R. I. State Col. Ext. Bul., 3 (1914), No. 13, pp. 3*).—This bulletin outlines the conditions to which some responsible person or organization agrees when taking up home garden work in cooperation with the agricultural college and the state board of agriculture, and includes a blank to be filled out and signed by the applicant. The college, through its extension department, will help to organize a home garden movement in any part of the State, pay the expenses of a lecturer who will speak before organizations, at schools, or wherever it is desired to interest children in home gardening, and give information on gardening problems. The state board of agriculture will furnish leaflets giving instruction as to the details of the gardening work, printed ribbons or badges which may be used as prizes for exhibits of home-grown products, and enrollment and report blanks.

Boys' and girls' clubs in Utah, J. C. HOGENSON (*Utah Agr. Col. Ext. Div. Circ. 14 (1914), pp. 24*).—This circular outlines the purpose, method of organization, and general regulations of boys' and girls' clubs, and regulations for various club contests.

Boys' corn club work in North Carolina, T. E. BROWNE (*North Carolina Sta. Circ. 17 (1914), pp. 3–12, fig. 1*).—This describes the work of the clubs and gives general directions and instructions for growing, harvesting, and handling corn for contests.

Instructions to members of the boys' corn club, W. J. JERNIGAN (*Arkansas Sta. Circ. 24 (1914), pp. 4*).—Instructions are given as to cultural methods employed in corn growing.

Boys' and girls' club work, J. C. HOGENSON (*Utah Agr. Col. Ext. Div. Circ. 21 (1914), pp. 28, figs. 28*).—Eleven lessons in sewing are outlined.

Boys' and girls' home gardens, E. K. THOMAS (*R. I. Bd. Agr. Bul., 1914, Apr., pp. 8, fig. 1*).—This bulletin contains directions for planting and caring for gardens, including planting tables and for selecting, packing, shipping, and staging vegetables for exhibiton.

Hunnicutt's agriculture for the common schools, J. B. HUNNICUTT, revised by R. J. H. DELOACH (*Atlanta, 1913, pp. XII+291, pls. 5, figs. 104*).—In this third edition the text has been almost entirely rewritten "with a view to giving

definite instruction on class room work in agriculture, to indicate how and where to find material with which to teach the subject and, lastly, how to use this material to the best advantage." It treats of the soil, plants, farm animals, dairy and poultry husbandry, school gardening, nature study, bird life, boys' and girls' clubs, and the farmer's opportunity. A list of agricultural references and useful tables are appended.

Simple furniture for school agriculture. J. MAIN (*Bul. Okla. Agr. and Mech. Col., 10 (1914), No. 79, pp. 8, figs. 7*).—Specifications are given for an agricultural display case, book section and library table, bulletin boxes, and bulletin and note covers, and attention is called to four methods for exhibiting small grain, seeds, and similar products, viz, in a seed-mounting case, 2-dram vials, sample tubes, and standard exhibit boxes, and to a cupboard for the storage of equipment.

Illustrated lecture on swine in the United States. W. B. JESSEE (*U. S. Dept. Agr., Office Expt. Stas. Syllabus 16 (1914), pp. 16*).—This syllabus is designed for farmers' institute and other extension lecturers and is to be used in connection with 44 lantern sides. Some of the topics considered are the construction of hog houses, sanitation and disease control, selection of breeding stock, swine management, breeds, and cost of production. A bibliography is appended.

Dairy laboratory manual and note book. E. L. ANTHONY (*Philadelphia and London, 1914, pp. 72, figs. 10*).—This group of 41 exercises, all of which have been used by the author in class work, is designed to cover the use of the Babcock tester, lactometer, and special work with farm separators and churns and to be used with courses having two or more hours laboratory practice each week. It is intended so to familiarize the student sufficiently with the general practice that he may be able to handle the more advanced courses in testing and creamery work.

The field of home economics. FLORA ROSE (*Cornell Countryman, 11 (1914), No. 8, pp. 271, 272, Advt. Sect. p. 10*).—The author points out how various sciences apply to woman's home work and discusses some vocations open to students in home economics.

MISCELLANEOUS.

Twenty-sixth Annual Report of Colorado Station, 1913 (*Colorado Sta. Rpt. 1913, pp. 31*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1913, a report of the director on the work and publications of the station, and departmental reports.

Twentieth Annual Report of Montana Station, 1913 (*Montana Sta. Rpt. 1913, pp. 137–184, fig. 1*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1913, a report of the director on the work and publications of the station, including a list of all publications since the organization of the station, and a summary of meteorological observations for 1913.

Twenty-fourth Annual Report of North Dakota Station, 1913 (*North Dakota Sta. Rpt. 1913, pp. 31*).—This contains the organization list, reports of the director and heads of departments, including meteorological observations abstracted on page 615 of this issue, and a financial statement for the fiscal year ended June 30, 1913.

Annual Report of Porto Rico Station, 1913 (*Porto Rico Sta. Rpt. 1913, pp. 34, pls. 4*).—This contains the organization list, a summary by the special agent in charge as to the investigations conducted at the station during the year, a report by the chemist and assistant chemist, and reports of the horticulturist, assistant horticulturist, plant pathologist, and animal husbandman, abstracted elsewhere in this issue.

NOTES.

California University and Station.—Dr. W. L. Howard, horticulturist at the Missouri University and Station, has been appointed associate professor of pomology beginning in February, 1915. Dr. Jacob Traum, formerly of the Bureau of Animal Industry of this Department, has been appointed assistant professor of veterinary science for the investigation of tuberculosis among domestic animals. Roland S. Vaile has been appointed assistant professor of orchard management, and assigned to the Graduate School of Tropical Agriculture at Riverside.

Georgia College and Station.—The following have been added to the staff of the college since September 1: J. B. Berry, formerly of the Pennsylvania College, as professor of forestry; E. G. Welch as instructor in farm mechanics; and in the extension service, G. L. Bigford, C. J. Goodell, and W. H. Howell as scientific assistants in animal husbandry, R. M. Gridley as instructor in animal husbandry, Dr. A. L. Hirleman and L. G. Proctor as field agents in hog cholera work, R. F. Irvin as instructor in poultry husbandry, D. J. Taylor as field agent in poultry husbandry, and S. H. Starr and E. C. Westbrook as instructors in agronomy.

Arrangements have been perfected by which the station will have at least five cooperative plats in different parts of the State where variety tests of field crops, including cotton, corn, small grains, and forage plants will be conducted. Arrangements have also been made for conducting investigations in fertilizers for apples in the northeast and northwest sections of the State.

Fred H. Smith has been appointed assistant chemist beginning September 15.

Kentucky University and Station.—B. D. Wilson, assistant chemist in the fertilizer department in the station, and C. B. Wilson, assistant in the hog cholera serum laboratory, have resigned. Recent appointments include in the station M. J. Smith and E. Huston as assistants in animal husbandry, and Robert Pfanstiel and E. H. Nollau as assistant chemists, and in the extension department Charles E. Stokes as agent in animal husbandry in cooperation with this Department.

Maryland College and Station.—H. J. Patterson has resigned as president, to take effect July 1, 1915, recommending in his letter of resignation the abolishing of the office of president and the substitution of an administrative commission consisting of a director of college work, the director of the station, and the director of extension work. This plan is under consideration by the board of trustees, as well as a plan for the reorganization of the subcollegiate courses at the institution with an agricultural high school along lines similar to that at the University of Minnesota.

Recent appointments include C. E. Temple, of the Idaho University and Station, as associate plant pathologist in the state horticultural department, R. C. Rose as associate botanist in connection with college and station work, and Stewart B. Shaw, of the North Carolina Station, as horticulturist in connection with the state horticultural work.

Massachusetts College.—Prof. George F. Mills, associated with the institution from 1889 until his retirement last April, died October 27, at the age of 75

years. During this long period of service he had been at various periods professor of English and Latin, head of the division of the humanities, treasurer of the college and station, acting president, and since 1907, dean. These activities brought him into close relations with trustees, faculty, and the student body; and for years his scholarly attainments, breadth of vision, and high character had been a powerful influence in the upbuilding of the institution.

New Mexico College and Station.—E. H. Divelbiss has been appointed assistant professor of horticulture and assistant horticulturist, vice J. W. Rigney, who has been made county agent in Pecos County under the extension division. P. D. Southworth and V. L. Martineau have been appointed county agents in Luna and Colfax counties respectively, and M. R. Gonzales for San Miguel and Mora counties.

North Carolina College.—Exercises in celebration of the twenty-fifth anniversary of the establishment of the college were held October 3. Governor Locke Craig presided, and the program included addresses by ex-Governor Thomas J. Jarvis, Hon. Josephus Daniels, Secretary of the Navy, and Hon. Carl S. Vrooman, Assistant Secretary of Agriculture, and greetings from the State Department of Education by J. Y. Joyner, state superintendent of public instruction; other colleges of the State by Presidents Edward K. Graham of the University of North Carolina and William L. Poteat of Wake Forest College; the State Department of Agriculture by Commissioner W. A. Graham; and this Department by Director A. C. True of this Office.

President D. H. Hill closed the exercises with a historical account of the establishment and progress of the institution. At its opening the equipment consisted of a single building, 62 acres of land valued at $2,500, and equipment estimated at $500. At present the college has 486 acres of land valued at over $125,000, over 20 buildings, and equipment inventoried at $240,000. The faculty has increased from five members to sixty-three, the experiment station workers from ten to sixty-five, and the student enrollment from seventy-two to seven hundred and thirty-eight. Even more striking has been the change in attitude of the people of the State, and President Hill declared that "the college counts its greatest gain in its quarter century of life to be the winning of the confidence and hearty good will of every class of people."

Oklahoma College and Station.—W. L. Fowler, of the Arkansas University and Station, has been appointed animal husbandman to take up his duties at once. A. H. Wright has resigned as assistant professor of agronomy and assistant agronomist to take up post-graduate work at the University of Wisconsin, and has been succeeded by R. E. Karper, assistant in cereal investigations at the Kansas Station. E. E. Hall has resigned to engage in county demonstration work in South Carolina and has been succeeded as assistant agronomist by Adrian Daane.

Oregon College and Station.—C. V. Ruzek, assistant agronomist at the Arkansas University and Station, has been appointed assistant professor of soils in the college and assistant agronomist in the station. Charles S. Brewster has been appointed research assistant in poultry, vice C. C. Lamb, who has been assigned to extension work in poultry husbandry. D. C. Howard, a 1914 graduate, has been appointed instructor in dairy husbandry.

Pennsylvania College.—Farmers' Week will be held from December 28, 1914, to January 2, 1915, and 180 lectures are scheduled for this occasion. The attendance last year was 980. A special section will be conducted this year for the benefit of boys, who are expected to be present in large numbers on account of the corn club service which has been inaugurated in a number of counties.

The school of agriculture has made exhibits showing the work of the station at sixteen county fairs. The exhibit is prepared in duplicate sets and has been the means of connecting the college with a large number of farmers who have become deeply interested in its work.

Miss Pearl MacDonald, of Wisconsin, has been added to the staff of the agricultural extension department in charge of home economics.

Rhode Island College and Station.—The entering class numbered 103, an increase of 30 per cent over the previous year and making the total enrollment 262. Much difficulty has been experienced in providing accommodations for this number of students.

President Edwards received the honorary degree of doctor of laws from Brown University at its recent celebration of its one-hundred fiftieth anniversary.

The department of extension work is being reorganized with the following personnel: Director of the extension service, A. E. Stene; junior extension work in boys' and girls' clubs and school gardens, Ernest K. Thomas; instructor in farm management and agricultural organization, David Elder; instructor in home economics, Miss Jennie E. Koehler; and demonstrator in agronomy, Myron A. Hawkins.

In the station, Robert A. Lichtenthaeler, assistant chemist, has resigned to pursue graduate study at Yale University, and Miss Marguerite W. Elkins, M. S., has been appointed assistant in animal breeding and pathology.

First Farmer's Club House in Indiana.—A farmer's club house of impressive design has been erected at Seymour as a memorial to Capt. Meedy W. Shields, a founder of the town and a donor of a fund utilized for the erection of the building. The club house was dedicated October 9, the principal addresses being made by Secretary Houston of this Department and Prof. G. I. Christie, of Purdue University. Secretary Houston discussed the workings of the Smith-Lever Extension Act, and drew special attention to the studies of this Department of marketing problems and in highway improvement.

Necrology.—Dr. D. E. Salmon, organizer of the Bureau of Animal Industry of this Department and its chief for over twenty years, died at Butte, Mont., August 30. Dr. Salmon was born at Mount Olive, Morris County, N. J., July 23, 1850, and entered Cornell University at its opening in 1868, gradually taking up veterinary studies. After six months spent at the Alfort Veterinary School in Paris, he was graduated from Cornell in 1872 with the degree of Bachelor of Veterinary Science, and four years later received that of Doctor of Veterinary Medicine.

After several years' veterinary practice, Dr. Salmon began his service with this Department in 1878 under a temporary appointment for the study of diseases of swine. Later he was appointed an inspector in New York in connection with contagious pleuro-pneumonia in cattle, and worked in the Southern States on Texas fever and other animal diseases. Early in 1883 he was called to Washington by Commissioner Loring to organize a veterinary division in the Department, which within a year was replaced by the Bureau of Animal Industry, established under an act of Congress, and served as its head until 1905. Among the specific achievements of the Bureau during this period were the eradication of contagious pleuro-pneumonia of cattle in 1892, the establishment of animal quarantine stations at the principal American ports and the promulgation of regulations for the safe shipment and humane treatment of cattle exported from the United States, the development of the export and domestic meat inspection service, and the suppression of foot-and-mouth disease. Im-

portant investigations were also conducted by him personally or under his direction, among them the pioneer work done in collaboration with Dr. Theobald Smith, begun in December, 1885, which established the highly important principle of vaccine therapy, and the determination of a protozoan as the cause of Texas fever in cattle and the method of its transmission through the agency of the cattle tick.

From 1907 to 1912, Dr. Salmon was in charge of the veterinary department in the University at Montevideo, Uruguay. During that time he was instrumental, among other things, in starting a veterinary journal published under the title of *Revista de Medicina Veterinaria de la Escuela de Montevideo*, to which he was a regular contributor. Returning to this country, he gave considerable attention to the preparation of hog cholera serum, and his last contribution was a paper on that subject published in the *American Veterinary Review*.

Francis Humphreys Storer, one of the few remaining pioneers in agricultural science in this country, died July 30, at the age of 82 years. His work was carried on at the Bussey Institution of Harvard University, following his appointment in 1870 as professor of agricultural chemistry, and the following year as dean, of the newly opened enterprise. Here he not only carried on instruction and administrative work until his retirement in 1907, but beginning in 1871 conducted, with his assistants, many researches in agricultural chemistry, notably with fertilizers. His most valuable contribution, however, was his treatise on Agriculture in Some of Its Relations with Chemistry, the first edition of which appeared in 1887, and which has run through seven editions and been twice revised. This book rendered special service because of its timeliness, appearing when the vast store of information it contained was very inaccessible, and was very helpful to the experiment station movement then just starting on a national scale under the Hatch Act.

Dr. William Saunders, director of the Canadian Experimental Farms from 1886 to 1911, died in London, Ontario, September 13, at the age of 79 years, Canadian Government in 1885 to report on experimental work in agriculture comprehensive development. His experimental work was largely as a plant breeder and hybridizer of fruits and cereals adapted to the Canadian climate, the Marquis wheat developed by his son, Dr. Charles E. Saunders, from types selected by him being one of the best-known productions. He was also much interested in entomology, botany, pharmacy, and medicine, a founder of the *Canadian Entomologist* and its editor from 1873 to 1886, and the author of an unusually large number of articles, bulletins, reports, etc., among them his well-known work on Insects Injurious to Foods (1883). He had received many scientific honors, including the presidency of the Royal Society of Canada in 1906, and was made a companion of the Order of St. Michael and St. George by King Edward VII in 1905.

Reorganization of Agricultural Work in Algeria.—Under a law of December 3, 1913, providing for a readjustment of the annual appropriation of $400,000 for agricultural and other developmental work in Algeria, plans are being put into effect for carrying on this work. Under these plans, $20,000 will be used for cooperative agricultural credit societies and $40,000 for long-term agricultural credit institutions. The remainder will be available for grants to building and marketing associations, mutual agricultural insurance societies, instruction, experimental, and extension work in agriculture, and a number of nonagricultural purposes.

The administration of the law is entrusted to a commission of which the Governor General of Algeria is president and the Director of Agriculture,

Commerce, and Colonization vice-president. This commission is to organize an instruction, experimental, and extension service and a superior board of advisers to assist this service in the direction and coordination of its work. The various existing agencies will be reorganized under this plan. Branches are contemplated in meteorology, agrogeology, agronomy, botany, and animal pests, special attention being given for the present to cereals, grapes, forage crops, and tree fruits. There will be a number of experiment stations, as well as a system of extension work through meetings, publications, model farms, and the like, and a corps of itinerant agents or instructors. The experiment station system is expected to include for the present a reorganization of the experimental garden at Hamma, a new station at Habra for the special study of irrigation and dry farming problems, and experimental fields at Sidi-bel-Abbès, Sètif, Serson, and Batna for forage crops, at Orleansville for tree fruits, at Guelma for forage crops, olives, etc., at Tlemcen for fruit growing, and at Kabylie for figs and olives. Dr. Charles Brunel has been appointed director of agriculture under the new system.

Agricultural Research and Education in Italian Africa.—A royal decree of March 3, 1914, provides for the establishment of the Agrarian Office of Tripolitania, the direction of which has been entrusted to Prof. Emanuel Cillis of the Royal High School of Agriculture of Portici. Grounds have been secured in the city of Tripoli and the director is engaged in formulating working plans, the activities of the office being divided into experimental, administrative, and miscellaneous services. The experimental division will be located on government land surrounding the old Turkish agricultural school in the oasis a short distance from Tripoli. The work of the office will include study and research in cultivation by irrigation and dry farming methods, the conduct of small farming units for better ascertaining the entire economic value of a given equipment, animal industry with particular reference to the improvement of native species, such as the camel, donkey, sheep, goat, cow, and horse, and to the increase of grazing land and provender, problems relating to brackish water, farm chemistry, vegetable biology and pathology, meteorology, rural engineering (particularly hydraulic problems), etc. A depository for farm implements and tools will be established not only for the needs of the station but also for loan or hire for private trials.

Agricultural Instruction in Western Australia.—The newly established university at Perth announces a 2-year diploma course in agriculture and a 3-year course leading to the degree of B. S. in Agr., and candidates may be required to pass an additional year at practical work on an approved farm. Two short courses for farmers were offered at the university from June 8 to July 3, 1914, including instruction in cultivation and cropping, elementary inorganic chemistry, elementary botany, and veterinary science, by means of illustrated lectures, laboratory work, demonstrations, etc. Single lectures or short courses of three lectures are also given at country centers by the university agricultural staff, when time permits, in the following subjects: Principles of agriculture, how crops grow, soil and its management, factors in wheat growing, soil moisture and dry farming, crop rotations and forage crops, fertilizers, milk and its management, breeds and management of sheep, principles of breeding, breeds and care of the horse, and parasites of interest to the farmer.

Conclusions Adopted by the International Phytopathological Congress.—The International Institute of Agriculture has recently published the complete text of the convention adopted and signed by the delegates at this congress (E. S. R., 30, p. 700), which has been submitted through the usual diplomatic channels for adoption by the various signatory nations. The principal conclusions agreed upon are in substance as follows:

The contracting countries shall adopt, if not already in existence, the necessary laws and administrative organization for carrying out the inspection of all nurseries, greenhouses, and other establishments offering plants for sale, verify reports of the occurrence of insect and fungus pests, investigate means for their control, and adopt regulations for the packing and shipment of plants. The governments shall, within two years, establish institutes for the scientific investigation of plant pests, provide for the inspection of shipments, and give certificates of freedom from disease or insect pests. For the present, grain, seed, onions, potatoes, grapevines, and all plants which enter into "grand culture" will not be included in the inspection, but no country shall admit nursery stock, bulbs, cuttings, grafts, or cut flowers from any other country except as accompanied by certificates signed by competent officials in the exporting countries. Each country reserves to itself the right to examine plants and their packing, and where pests are found contrary to the certificate of the exporting country, notice will be furnished the exporting country, which shall at once take proper recognition of the condition. The infected plants will be returned to the exporter or burned and evidence of their destruction forwarded.

Certificates of inspection shall be uniform and be printed in French and also in the language of the country of their origin. The importation of living plants without certificates is permitted by scientific institutions duly authorized by their governments, but all reasonable precaution should be taken against the possible dissemination of any pests. For contiguous countries such exchange of plants should be as near the frontier as possible.

Upon their adherence to the convention the different countries shall furnish lists of plant pests against which protection is desired, and these shall be noted in exporting certificates. This list shall be limited to those pests that are liable to become epidemic or destructive to crops of various kinds, or which are readily propagated on living plants or parts of plants.

The International Institute of Agriculture at Rome is recognized as the official center to which all matters regarding plant pests are to be referred. All questions of controversy of two or more countries are to be referred to a mixed commission of phytopathologists for examination with a view to suggesting means for harmonizing the differences. No country is to extend to a noncontracting country any consideration not given the countries signing the convention.

American Association for the Advancement of Science.—In commemoration of the completion of the Panama Canal, an extensive series of scientific meetings in San Francisco and vicinity is being planned for the first week of August, 1915. The meetings concerned with agricultural science will deal in general with questions of food supply and of agricultural conservation, and of these sessions at least one will be devoted to subjects of nutrition, and one to more general questions of agricultural chemistry. It is expected that a number of national chemical and agricultural societies will convene in conjunction with the meetings of the American Association.

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U. S. Department of Agriculture.

EXPERIMENT STATION RECORD.

VOL. XXXI. DECEMBER, 1914. No. 8.

From the beginning of agricultural instruction and experimentation, the study of field crops, their growth, nutrition, and reproduction, has naturally occupied a prominence second to no other subject. Crops are aggregations of plants, governed by definite laws and responsive to various factors and conditions. These laws and the influence of factors and conditions on the life activities of crop plants, such as we know of them, are embraced in plant physiology.

Hence an intelligent understanding of plants and their growth implies a study of plant physiology, not in a superficial way but as one of the fundamental subjects in acquiring intimate familiarity with agricultural plants and the factors of their growth. Some general empirical information can be acquired through lectures on botany, agronomy, or agricultural chemistry, as is done in short course instruction, but the needs of a reasoning knowledge and understanding are not satisfied in this way. They require a more thorough insight. The place where the subject is taught is less essential than that it should be taught thoroughly and effectively. And a consideration of it needs to enter more largely into certain features of agricultural experimentation.

In a recent publication[a] a criticism is given of the courses of botany in the agricultural colleges of this country, and a plea is made for more attention to plant physiology. If, as the author claims, "the object of agricultural education is to produce farmers who will do their work more intelligently," the criticism is well taken. If the object of education is to train the student how to observe and correlate facts without reference to their practical application, then the pedagogical value of physiology will be found equal to any other branch of the science of botany. For the individual who contemplates following agricultural pursuits a proper understanding of plant life is essential, and such a view can be obtained only by observing how different organs of the plant cooperate to produce the phenomena of growth, nutrition, reproduction, etc.

[a] Science, n. ser., 40 (1914), No. 1029, pp. 401–405.

A study of the catalogues issued by the colleges of agriculture shows that there is a wide range in the amount of instruction in plant physiology and in the number of credits given it by the different institutions. In some, work in plant physiology is required of students of agriculture, while in others it is optional. The place it comes in the curriculum may be anywhere from the freshman to the senior year. In some institutions with which the colleges of agriculture are affiliated the students in the so-called arts courses are given opportunity to take more work in plant physiology than is given to the student in agriculture. Some institutions apparently offer no instruction that can in any way be called a course in plant physiology. Some give it a limited amount of attention in a general course in botany that covers one year's time. In these cases there are no statements indicating the relative amount of time given to this part of the general topic.

Most of the colleges offer definite courses in plant physiology, which range from a weekly lecture or recitation and a laboratory exercise for one semester, to three or more lectures and a corresponding amount of laboratory work running through an entire year, with optionals for additional study along the same line. Unfortunately the latter class is in a considerable minority. This is hardly as it should be. The student of agriculture is vitally interested in plant life and should be given ample opportunity to learn the normal behavior of plants, for it is upon the proper development of his crops that his success as a farmer will depend.

In nearly every catalogue examined the course in botany included classification as a rather important part of the work. While the amount of time and relative importance assigned to it are less than formerly, yet it is retained to the at least partial exclusion of other studies. This is due probably to the historical position it has held in college courses, and the conservatism of some who have the making up of the curriculums. The classification of plants and calling them by their scientific names are not to be condemned in themselves, but they are not all of botany any more than the memorizing of symbols and atomic weights are all of chemistry. Fortunately, more attention is now being given to the plant as a living organism; and in order to provide sufficient opportunity to more completely study the plant as such, some of our greatest institutions no longer attempt to equally cover all the branches into which botany has been divided, but content themselves with specializing along a few lines. This principle could safely be adopted by others, leaving to special institutions those branches of the subject that do not immediately articulate with the general course of training. In making such an adjustment the agricultural colleges should frequently give a larger part to plant physiology than is now given it.

In courses of instruction dealing so largely with crops it would seem that more consideration should be given the principles underlying their growth, nutrition, water requirements, reproduction, etc. Doubtless in some way the general facts are set forth, but it is probably true that comparatively few students have first hand information regarding these subjects, and at most as related to more than a single leading agricultural crop.

There can hardly be anything more important to the farmer than definite information and understanding regarding the growth of his crops. As the writer referred to has stated, "plant industry as a science must rest on an understanding of plants." And yet, the normal rate of growth at various stages of development is practically unknown to the average student and indeed to many experimenters for the conditions under which they are working. The influence of various factors on growth is little understood, except in a very general way, although some of these factors can be controlled and growth accelerated or retarded as is necessary or desirable. It is probably true, as the writer referred to intimates, that very few students follow through the various stages of a single crop to determine its normal growth and the influence the more important environmental factors may exert upon it.

Perhaps next in importance are the questions of transpiration and water supply. In the regions where irrigation is generally practiced it is quite evident that there is little or no attempt at a system of applying water that is based upon the physiological activities of the plant. This leads to irrational practice in applying water that may be wasteful and injurious. The assumption that alfalfa, sugar beets, orchard, and horticultural crops all require the same amounts of water and at the same intervals during the growing season is manifestly wrong, yet in many localities the only measure is so many inches of water at certain arbitrarily determined intervals. This is often based upon the engineer's estimate of the amount of water available and not upon what or when it is needed; and it is not only wasteful of water, but may be positively injurious to the crop and detrimental to the soil. It is well known that the water factor can be controlled to a considerable degree, and if students were required to study the matter in detail, paying attention at the same time to transpiration under controlled conditions, a new practice in irrigation farming might ultimately result.

It is probable that plant nutrition receives more attention in our agricultural colleges than any other physiological function. But even here the laboratory work is reduced to the minimum, and much is done in field plats where definite control is lacking. There is need of much more study of plant nutrition than is included in fertilizer tests as they are usually made. Water cultures, supplemented with

pot and plat work, might be carried on in such way that the student could determine for himself the important facts in the mineral nutrition of plants. This is one of the plant activities that can be rather definitely controlled, and the fundamental principles underlying the application of fertilizer elements should be thoroughly mastered.

Photosynthesis, which is very little subject to control or regulation, is generally studied where laboratory work is done, while other functions that may be definitely directed to the advantage of the crop and the profit of the grower are neglected. Respiration, the response to stimulus, and the physiology of reproduction, are usually passed over with slight attention, although all of these functions have a direct bearing on the welfare of the plant.

In the field of investigation, one aspect of plant physiology is almost wholly overlooked, that is, the relation it bears to plant diseases. So long as the normal functions of the plant are not fully understood it will be impossible to know very much of the abnormal or pathological conditions. Studies are generally made of the organisms which cause disease, and experiments are conducted that look to controlling their spread, but very few investigations are undertaken to determine the nature of the effect of the parasite on its host, or as to how the injury is brought about. The study of plant diseases due to fungi and other organisms receives much attention, but the large and important class of plant injuries due to what are usually designated physiological disturbances receives rather scant study. True, little is known of how these disturbed conditions are brought about, but this lack of knowledge should stimulate investigation along this line. In the treatment of plant diseases the outward manifestations are usually given more consideration than the constitutional changes produced. As long as this is true, prevention rather than cure will be the result. But even in the prevention of plant diseases very little is known as to the principles underlying immunity or resistance to the attack of certain organisms.

Some of the above statements are not intended to apply to the teacher alone. Investigators are needed to clear up many little known facts concerning the activities of plants. But if more emphasis were given to the importance of a study of plant physiology in its agricultural relations, more investigators would be trained who might address themselves to the problems in that field.

The extent to which the physiological aspects of plant growth are studied or taken account of in connection with field experiments seems quite inadequate. These experiments are extensive in number and constitute a large feature of experiment station work. But much as we discuss their importance and their limitations, and attempt to provide greater accuracy, features of great significance are

often neglected which would add to their information value and assist in their interpretation. Too often the end sought seems to be comparisons measured by ultimate production, rather than the tracing of relations between causes and effects.

Field experiments with agricultural plants, considered in their fundamental aspects, are to large extent studies of the response of these plants to definitely known environmental conditions; and yet how rarely are these responses measured expressly or continuously at successive stages. To determine the response effectually, the conditions must be definitely known, and the plans must be so made and the observations so taken that correlations can be attempted. The life processes in the growing plant need to be followed if the effects of the special conditions imposed are to be determined.

Consider the usual field experiment with fertilizers, or upon the preparation of the land, or culture methods, or date or rate of seeding, rotations, and the like. The land is selected and prepared with care, divided into plats with mathematical accuracy, and the different treatments carried out systematically. Notes are taken from time to time on the general appearance of the plats, often supported by photographs, the date of blooming or fruiting or other stages noted, and when the crops are harvested provision is made to insure against loss, and the weights or volume are accurately recorded. Analyses may be made of the materials applied or sown, and of the resulting crops. But the growing crop is usually not studied in a way to determine the manner in which it is responding to the special conditions. Rarely, indeed, are any systematic measurements taken of the plants, or attempts made to get at critical stages of growth or the effects of the treatment at such times. The physiological activities of the plants throughout their growth are not followed, and often can not be followed because the field experiments have not been supported by experiments which provide a larger measure of control. The growth under the different treatment can not be compared with the normal growth at various stages, because provision for this is lacking.

If conditions of normal growth were maintained as a check, it would be possible to judge of the accelerating or retarding effect of each treatment at successive stages, and the adaptability of the plant and its capacity to overcome adverse conditions or to minimize their effects later could be arrived at with considerable accuracy. Furthermore, something could be learned of the effects of changes in temperature of the air or soil, or the periodicity of the rainfall and other external phenomena which experiments in the field are subject to. Instead of measuring these, the attempt is usually made to eliminate them by averaging the results of several years.

In short, the usual field experiments, which form such a prominent feature of station work, teach but little in a definite way as to the life of the plants concerned in them or of the exact conditions of their growth, and they contribute far less than they should to a thorough knowledge and understanding of these plants.

In too large a proportion of these experiments the main interest and reliance seems to be placed on the weight or bulk of the harvested crop. This of course is the final measure from an economic point of view, to determine whether a practice or treatment is profitable or advisable. But in investigation, and in all experiments except those of the most rudimentary kind, the aim should be to learn not merely the economic result but something of the way in which the result has been brought about, and the effect upon the plant to the imposed conditions. The living plant must be studied quite as much as the final yield.

These things are highly essential if field experimentation is to develop along scientific lines and make progress in laying the foundation for an intelligent agriculture. They require far more attention to a certain kind of details than is now given. They require continuous study, with attempts at correlations of growth and specific conditions throughout the season. Otherwise the final result is a composite result of all the conditions, and there is no means for determining how much is to be attributed to particular artificial conditions imposed, or how far the effect of these has been masked by other unfavorable conditions.

To make these continuous studies of the plants and their surroundings implies a smaller number and less diversity of field experiments, and greater attention to those which are undertaken. It will mean more study in planning the work, to provide such checks under more refined conditions of experiment as are necessary to furnish reliable comparisons. It will call for some system of accurate measurements at regular intervals, and the recording of uncontrolled phenomena which may influence growth or physiological function. It will require living with the experimental material—a closer association with the plants and concentration on their study.

Under such close observation there will be no lack of problems. The investigator with vision and imagination will be confronted with them on all sides, and instead of allowing them to bewilder him with their confusion he will devise means to regulate them and take account of them in his plan of experiment. This will make the methods of experimental agronomy more exact and more searching in character, and will make interpretation more sure. It might relieve the necessity for some of the repetition that has been going on so many years.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

A contribution to the chemistry of phytin, R. J. ANDERSON (*New York State Sta. Tech. Bul. 32 (1914). pp. 3–44*).—The subject is treated under four different headings, as follows:

I. *Concerning the organic phosphoric acid of cotton-seed meal, II* (pp. 4–11).—Since the results of Rather (E. S. R., 29, p. 804) did not harmonize with the earlier work of the author (E. S. R., 28, p. 505) the work on cotton-seed meal was repeated in the hope of establishing more definitely the composition of the organic phosphoric acid of cotton-seed meal. From 25 lbs. of cotton-seed meal 69 gm. of barium salt, after recrystallizing eleven times, was obtained. It was free from heavy metals other than barium and no weighable quantity of alkalis could be obtained from 0.5 gm. of the salt. "It was completely free from inorganic phosphate and it was free from nitrogen and sulphur." Silver salts prepared from the isolated acid did not seem to be suitable for identifying the acid in question. They were obtained as amorphous precipitates and did not represent homogeneous salts. They are believed to be mixtures of more or less acid silver salts of inosit hexaphosphate because after deducting the amount of silver found, allowing for a corresponding amount of hydrogen and water and calculating to free acid, the results agreed very closely with the percentage composition calculated for inosit hexaphosphate. The acid preparation used did not give, as Rather found in his investigations, a precipitate on the addition of alcohol.

II. *Concerning phytin in oats* (pp. 12–21).—The purpose of this investigation was to determine whether the phytin in oats (E. S. R., 21, p. 608) was identical with the phytin from other sources. Several preparations were made from different lots of oats with a 0.2 per cent hydrochloric acid solution and precipitation as a barium salt with barium chlorid. "The substance was then repeatedly precipitated from dilute hydrochloric acid alternately with alcohol and with pure recrystallized barium hydroxid (Kahlbaum) until all bases other than barium were removed and until all the inorganic phosphate was eliminated."

No crystalline substance was obtained, but on analysis the various preparations gave analytical results which agreed well amongst themselves although the composition was considerably different from that of phytic acid. The preparations were found finally to consist of two different organic phosphoric acids, but only one was isolated in a pure form. The portion insoluble in water after removal of the soluble part was obtained as a barium salt in crystalline form in the same manner as in the case of that prepared from cotton-seed meal. "So far as one can judge by crystal-form, composition, properties, and reactions, the crystalline salts obtained from oats and cotton-seed meal are identical." The water-soluble substance noted above could only be obtained as a snow-white amorphous powder the composition of which differed entirely from the

crystalline product, but only very slightly from that isolated from wheat bran (E. S. R., 28, p. 17). Like the crystalline barium salt obtained from cotton-seed meal, that from oat seed does not agree with the usually accepted formula for phytic acid, viz, $C_6H_{24}O_{27}P_6$ (see also E. S. R., 19, p. 966). Apparently oats contain two different phosphoric acids.

III. *Concerning phytin in corn* (pp. 22–26).—This subject has been previously studied by Vorbrodt (E. S. R., 26, p. 501) and Hart and Tottingham (E. S. R., 21, p. 608). The substance isolated in these investigations was re-examined by the author and a crystalline barium salt was prepared with some difficulty. Judging from the crystalline structure, composition, and properties, the substance is identical with the salts previously isolated from cotton-seed meal and oats, namely, salts of inosit hexaphosphate.

"The analytical results obtained from these purified crystalline barium salts do not agree with the formula proposed by Vorbrodt. The phosphorus is over 1 per cent higher and the relation between carbon and phosphorus is as 1:1. The phosphorus content is also considerably higher than that required for a corresponding salt calculated on the usual phytic acid formula. The barium salt analyzed by Vorbrodt had been prepared from the previously isolated acid by partially neutralizing with barium hydroxid and concentrating in vacuum. The crystalline salt which then separated was washed, dried, and analyzed. Apparently no attempt had been made to recrystallize it and it is probable that the substance had contained small quantities of impurities which might be sufficient to account for the difference in analytical results between his product and the repeatedly recrystallized salts which have now been analyzed."

IV. *Concerning the composition of barium phytate and phytic acid from commercial phytin and a study of the properties of phytic acid and its decomposition products* (pp. 27–44).—The salts of phytin, previously reported upon (E. S. R., 27, p. 712) were prepared from commercial phytin, and most of these were amorphous, particularly the barium salts, and in only one case was a crystalline salt obtained. The amorphous salts on analysis gave results which corresponded closely to the usual formula ascribed to phytic acid. As some doubt was felt as to whether these amorphous compounds were homogeneous an investigation was made of commercial phytin, using the same methods as before, to see if any real difference existed between the barium salts of phytic acid prepared from commercial phytin and the crystalline salts obtained from cotton-seed meal, oats, and corn.

"After carefully purifying the barium salt of the substance we found that it crystallized very readily and no difference could be observed either in crystal form, composition, or reactions of the salts prepared in this way from the crystalline salts previously referred to. All of these compounds are therefore identical and the analytical data indicate that they are salts of the acid $C_2H_6O_3P_2$ or $C_6H_{15}O_{24}P_6$. The composition, as determined by analysis, of the free acid prepared from the crystalline barium phytate also agrees more closely with the above formulas than with the usual formula of phytic acid, $C_6H_{21}O_{27}P_6$. The phosphorus was found too low in this case as well as in the acids previously described. This, however, is undoubtedly due to the fact that the acid is largely hydrolyzed on drying. It appears very probable then that the organic phosphoric acid described above and known as phytic acid is either inosit hexaphosphate, $C_6H_{15}O_{24}P_6$, or else an isomer of the same. We have, however, no direct information concerning the molecular magnitude of the acid."

Attempts to prepare a neutral ester of the acid with a view of determining the molecular weight and also the preparation of a neutral silver salt failed. "Only acid silver salts have been obtained even from solutions of phytic acid neutralized with ammonia. From such salts, naturally, only acid esters could

be obtained." "Tribarium inosit hexaphosphate, $C_6H_{12}O_{24}P_6Ba_3$, [was] obtained as minute bundles or globules of microscopic needles from dilute hydrochloric acid solutions by the addition of alcohol, and heptabarium inosit hexaphosphate $(C_6H_{11}O_{21}P_6)_2Ba_7$, or $C_{12}H_{22}O_{48}P_{12}Ba_7$, which separated from dilute hydrochloric acid solutions in the presence of barium chlorid in globular masses of needle-shaped crystals. The free acid prepared from the crystalline barium salts agrees more closely in composition with inosit hexaphosphate, $C_6H_{18}O_{24}P_6$, than with the usual formula for phytic acid, $C_6H_{24}O_{27}P_6$. . .

"The spontaneous decomposition products of phytic acid under ordinary conditions which are formed within a reasonable length of time appear to be phosphoric acid and substances which contain more carbon and less phosphorus than phytic acid, which substances are probably penta-, tetra-, etc., phosphoric acid esters of inosit. When phytic acid is dried at a temperature of 105° C., under reduced pressure, it rapidly decomposes with liberation of inorganic phosphoric acid and the formation of various decomposition products, consisting of inosit and substances varying in composition from inosit tetraphosphate to inosit monophosphate. When the crystalline barium salts are dried at 105° under reduced pressure they suffer but slight hydrolysis. Under ordinary conditions the dry salts are comparatively stable but on longer keeping small quantities of inorganic phosphoric acid are liberated."

The glycerotriphosphoric acid of Contardi, P. CARRÉ (*Bul. Soc. Chim. France, 4. ser., 13 (1913), No. 2, pp. 66–69*).—The theory of Contardi that one molecule of glycerol reacts with three molecules of phosphoric acid to form quantitatively one molecule of $C_3H_5(H_2PO_4)_3$ is deemed incorrect. The products are said to be $C_3H_5OH(H_2PO_4)_3$, $C_3H_5(OH)_2(H_2PO_4)$, and a di-ester of the type $C_3H_5(OH)HPO_4$.

Preparation, composition, and properties of caseinates of magnesium, L. L. VAN SLYKE and O. B. WINTER (*New York State Sta. Tech. Bul. 33 (1914), pp. 3–7*).—Continuing previous work by the senior author and Bosworth (E. S. R., 29, p. 9) a study was made of the compounds formed by casein with magnesium.

"In preparing magnesium caseinates, the solution of casein in magnesium hydroxid was effected by suspending pure casein in water with an excess of finely-divided magnesium oxid, allowing the mixture to stand several days with occasional agitation.

"The magnesium hydroxid solution of casein [was] made neutral to phenolphthalein with HCl and the solution dialyzed and evaporated to dryness. The preparation contained 1.06 per cent Mg (1.76 MgO), the theoretical composition being 1.09 per cent Mg (1.81 MgO); or 1 gm. of casein combined with 8.7×10^{-4} gm. equivalents of Mg (theoretical, 9×10^{-4}). The compound [was] easily soluble in water and in a 5 per cent solution of NaCl.

"The magnesium hydroxid solution [was] made neutral to litmus with HCl and the solution dialyzed and the caseinate precipitated with alcohol. The preparation contained 0.71 per cent Mg (1.18 MgO), the theoretical composition being 0.67 per cent Mg(1.12 MgO); or 1 gm. of casein combined with 5.8×10^{-4} gm. equivalents of Mg (theoretical, 5.6×10^{-4}). The compound is easily soluble in water and in a 5 per cent solution of NaCl.

"A solution of base-free casein in magnesium hydroxid was treated with HCl just to the first point of precipitation and then dialyzed. Alternate addition of acid and dialysis [were] repeated, until finally the dialyzed solution formed a permanent precipitate on the addition of any acid. To this solution [was] added one-third of the amount of acid required for complete precipitation of the casein, the solution filtered and dialyzed and divided into two portions. One

portion [was] used for the preparation of monomagnesium caseinate by incomplete precipitation with HCl. The preparation contained 0.13 per cent Mg (0.22 MgO), which is the theoretical composition; or 1 gm. of casein combined with 1.1×10^{-4} gm. equivalents of Mg. This compound [was] insoluble in water but soluble in 5 per cent solution of NaCl; at 65° C. it tended to form strings when drawn out.

"To the second portion of the solution mentioned in the preceding paragraph acid-free alcohol [was] added and a precipitate obtained which contained 0.24 per cent Mg (0.4 MgO), the theoretical composition of di-magnesium caseinate being 0.26 per cent Mg (0.44 MgO); or 1 gm. of casein combined with 2.1×10^{-4} gm. equivalent of Mg (theoretical 2.25×10^{-4}). The compound is quite easily soluble in water and in a 5 per cent solution of NaCl; at 65° it is slightly sticky.

"These four magnesium caseinates correspond to the four calcium caseinates which have been previously prepared, representing octo-, penta-, di-, and monocaseinates of magnesium."

Why sodium citrate prevents curdling of milk by rennin, A. W. Bosworth and L. L. Van Slyke (*New York State Sta. Tech. Bul. 34 (1914), pp. 3–9; Amer. Jour. Diseases Children, 7 (1914), No. 4, pp. 298–304*).—The practice of adding sodium citrate to cow's milk in the process of modifying it for infant feeding purposes has been common for many years. Its use is especially valuable for those children where cow's milk forms exceedingly large lumps of tough curd after entering the stomach. These lumps of curd can pass practically unchanged through the entire course of the intestinal canal and do, by either mechanical or other means, cause serious interference with the process of digestion. The favorable results attending the use of sodium citrate in preventing the formation of these curds, however, have never been explained on the basis of actual investigation.

It is pointed out as a result of these studies that the addition of sodium citrate to normal milk renders some of the insoluble calcium present soluble. This increase in soluble calcium is due to a reaction between calcium caseinate and sodium citrate by which is formed sodium caseinate (or calcium-sodium caseinate) and calcium citrate. This reaction is also reversible.

"The curdling of milk by rennin is delayed by the presence of sodium citrate; when there is added 0.4 gm. of sodium citrate per 100 cc. of milk (equal to 1.7 gm. per ounce), no curdling takes place. The curd produced by rennin in the presence of small amounts of sodium citrate (0.05 to 0.35 gm. per 100 cc. or 0.2 to 1.5 grains per ounce) increases in softness of consistency as the amount of sodium citrate in the milk increases.

"The results of our work indicate that at the point at which rennin fails to curdle milk we have in place of the calcium caseinate of normal milk a double salt, calcium-sodium caseinate; this double salt, when rennin is added, is changed to a calcium-sodium paracaseinate which, owing to the presence of the sodium, is not curdled. The practice of adding sodium citrate to milk at the rate of 1 to 2 grains of citrate per ounce of milk appears to have a satisfactory chemical basis in the reaction between the sodium citrate and the calcium caseinate of the milk. The amount added is governed by the object in view, viz, whether it is desired to prevent curdling or only modify the character of the curd in respect to softness."

See also a previous note (E. S. R., 29, p. 805).

Studies on enzym action.—VIII, A continuation of the study of the action of amino acids and castor bean lipase on esters, M. L. Hamlin (*Jour. Amer. Chem. Soc., 35 (1913), No. 12, pp. 1897–1904*).—Continuing work previously

noted (E. S. R., 30, p. 806), the selective lipolytic actions of glycin, alanin, phenylalanin, and castor bean lipase on methyl, ethyl, glyceryl tri- and phenyl acetates, ethyl butyrate, and ethyl and phenyl benzoates have been compared, and that of castor bean lipase on castor oil and olive oil has been measured.

It is shown that the selective lipolytic action of glycin on methyl acetate and ethyl butyrate is more marked in the presence of certain concentrations of hydrochloric acid. This selective action was measured. With the glycin-hydrochloric acid solution used, the hydrolysis of methyl acetate and ethyl butyrate was not proportional to the hydrogen ion concentrations of the solution, and the disproportionality, which was measured, was comparatively large.

Studies on enzym action.—IX, Extraction experiments with the castor bean lipase, K. G. FALK (*Jour. Amer. Chem. Soc., 35 (1913), No. 12, pp. 1904–1915*).—"The result of extraction experiments in which the lipolytic activities of the filtrates and residues of a castor bean preparation after treatment with water, 0.1 molar sodium fluorid, molar sodium chlorid, and molar methyl alcohol solutions, were tested toward ethyl butyrate and triacetin, confirmed the conclusion given in the fifth and sixth papers [E. S. R., 20, pp. 409, 806] that the inhibiting actions of these solutions on the lipase were due to precipitating or coagulating actions.

"Two lipases were shown to be present in the preparation. One of these was soluble in water, the other insoluble. The former exerted a comparatively greater action toward ethyl butyrate than toward triacetin, the latter a greater toward triacetin than toward ethyl butyrate.

"Extraction experiments with solutions of magnesium and manganous sulphates which showed acceleration with unfiltered preparations indicated that the accelerations were due mainly to the action of the salts on the residues. Filtration also appeared to decrease the accelerating actions of these salts."

Quantitative investigation with reference to the action of monochromatic ultraviolet rays upon amylase, A. and MME. CHAUCHARD (*Compt. Rend. Acad. Sci. [Paris], 156 (1913), No. 24, pp. 1858–1860; abs. in Chem. Ztg., 37 (1913), No. 103, p. 1036*).—The photochemical action of ultraviolet rays upon amylase is proportional to the absorption of these rays by the solution in which the ferment is held. A portion of the radiant energy in the experiments was capable of raising the temperature of the solution 0.25° C. and decomposed four-tenths of the enzym present.

The influence of salicylic acid upon the amylolytic action of aqueous extracts of malt, E. HEUSCH (*Arch. Farmacol. Sper. e Sci. Aff., 13 (1912), No. 7, pp. 307–323, fig. 1; abs. in Zentbl. Biochem. u. Biophys., 14 (1912), No. 7–8, p. 297*).—Acids play an important part in the hydrolysis of starch to maltose because when present in small amounts they increase the activity of maltase, while large quantities inhibit the activity. Salicylic acid is the most prominent in this regard, because of the presence of a phenol radical in the molecule.

About the biolytic cleavage of gluten, V. S. SADIKOVA (*Zhur. Russ. Fiz. Khim. Obshch., Chast Khim., 44 (1912), No. 5, pt. 1, pp. 1026–1053; abs. in Chem. Ztg., 37 (1913), No. 47, Repert., p. 220*).—*Proteus vulgaris* and *Penicillium glaucum*, when acting upon gluten, produce more volatile acids and bases than do either acids or enzyms. The experiments also show that *P. vulgaris* and *P. glaucum* assimilate atmospheric nitrogen when grown on a gelatin plate.

Measurement of tryptic protein hydrolysis by determination of the tyrosin liberated, S. J. M. AULD and T. D. MOSSCROP (*Jour. Chem. Soc. [London], 103 (1913), No. 604, pp. 281–284; abs. in Analyst, 38 (1913), No. 445, p. 153*).—The method is a modification of that described by Brown, Millar, and others, which consists of the estimation of the absorption of bromin by the tyrosin liberated.

Instead of determining the end point of the reaction by noting the yellow color or using starch and iodid of potash, it is advisable to employ methyl violet or gentian violet in a 1 per cent solution in 70 per cent alcohol.

"About 10 drops of this solution is added to 10 cc. of 5 per cent hydrochloric acid and dotted over a white tile. The addition of sodium bromate or traces of free bromin causes a change from olive green (the color of the dyestuffs in acid solution) to a deep bluish-violet. The change is sharp, but the color fades after a few minutes. Dibromotyrosin only is apparently formed and the absorption at first is very rapid, but falls off considerably toward the end of the reaction, as experiments cited show. The solution to be titrated is made of not more than 5 per cent acidity with hydrochloric acid; a lower concentration than 2 per cent turns the indicator blue, while more than 5 per cent turns it yellow. To the acid solution is added 15 to 20 cc. of 20 per cent sodium bromid, and the liquid is then titrated with twentieth-normal sodium bromate. Toward the end of the reaction at least 30 seconds should elapse between successive additions of the bromate, and the solution should be well shaken in a stoppered bottle.

"Results quoted show a plus error varying from 0.4 to 2.3 per cent. In two of the test liquids there were present, in addition to tyrosin, leucin, asparagin, and ammonium chlorid. Experiments carried out with edestin digested in dilute sodium carbonate solution with trypsin, and corrected for the bromin absorbed by the protein, confirmed Brown and Millar's contention that the method can be used for determining tyrosin in presence of proteins and other early cleavage products, and also that practically all the tyrosin is liberated in the first stages of tryptic digestion."

Accuracy of the estimation of l-tyrosin in proteins, E. Abderhalden and D. Fuchs (*Hoppe-Seyler's Ztschr. Physiol. Chem., 83 (1913), No. 6, pp. 468–473; abs. in Analyst, 38 (1913), No. 446, pp. 219, 220*).—The Folin and Denis colorimetric method for determining tyrosin (E. S. R., 28, p. 805) in proteins is said to yield high results because similar colors are produced by oxytryptophan and tryptophan.

The authors observed, as did Folin and Denis, that the separation of tyrosin by simple crystallization is very difficult. "The cause of this has been traced in certain cases to absorption of acid or ammonia fumes from the atmosphere during evaporation in open basins. Much better results are obtained if the evaporation be conducted under reduced pressure. A more interesting reason for quite considerable quantities of tyrosin failing to crystallize is the formation of salt-like compounds with the basic constituents of proteins, such as the compound of tyrosin with lysin observed by Fischer and Abderhalden. In view of this experience, tests were made to determine whether it is possible to recover quantitatively tyrosin added to gelatin. Tyrosin-free gelatin was dissolved in five times its weight of 25 per cent sulphuric acid, a known quantity of tyrosin added, and boiled for 20 hours. Baryta was then added to remove the sulphuric acid, and the barium sulphate extracted with boiling water until the extract no longer gave a violet color with a 1 per cent aqueous solution of triketohydrindene hydrate (ninhydrin). This reagent proved much more delicate than Millon's reagent. By concentrating the combined filtrates at 45° C., it was possible to recover as much as 90 per cent of the added tyrosin. In certain cases, however, the yield amounted to only 60 to 70 per cent.

"It was found possible to recover the tyrosin almost quantitatively by the following method: The liquid after hydrolysis was diluted until it contained 2.5 per cent sulphuric acid. A 10 per cent solution of phosphotungstic acid was then added with constant stirring, great care being taken to avoid the addition of any excess. The precipitate was filtered off and washed, and the filtrate treated with baryta to remove phosphotungstic acid and filtered. To this filtrate

the exact amount of sulphuric acid needed to remove the excess of baryta was added and the barium sulphate extracted with boiling water until no coloration was given by ninhydrin [E. S. R., 26, p. 804]. The filtrate was then concentrated at 40° C. under reduced pressure until the mother liquor gave no reaction with Millon's reagent. The crude tyrosin which separated was purified by boiling with animal charcoal and fractional crystallization from water until a sample on analysis yielded figures agreeing with pure tyrosin."

Formol-titrametric investigations with proteins, II, F. OBERMAYER and R. WILLHEIM (*Biochem. Ztschr., 50 (1913), No. 5–6, pp. 369–385*).—Continuing work previously noted (E. S. R., 27, p. 501), the authors emphasize the fact that with the formaldehyde titration method the terminal amino groups of proteins can be determined. The quotient obtained by dividing the total nitrogen by the number of such amino groups, and which shows how much nitrogen belongs to each amino group, is termed the amino index.

The index of euglobulin (average 21.5) is much greater than albumin (average 12). In the Mammalia this also applies to pseudoglobulin, whereas in the hen the index of pseudoglobulins (average about 15) is not so sharply differentiated from albumin.

With the procedure it can be shown that the large protein fractions do not consist of unit substances; thus with pseudoglobulin, by salting out with 44 per cent of ammonium sulphate and albumin with a 66 per cent ammonium sulphate solution, it is possible to obtain two fractions which differ very much in their amino indexes.

This work, according to the authors, for the first time shows that a constitutional difference exists between two different serum proteins. In the case of the hen the amino indexes of the fractions obtained with a 25 per cent ammonium sulphate solution and those given by a 30 per cent ammonium sulphate solution (average 32.5 and 28.5, respectively) were much higher than those given by the serum proteins of the bovine (average 19 and 21.5, respectively). Those of the horse were found to behave in exactly the same manner as in the bovine, and those in the goose like those in the hen.

Detection of saponin, L. ROSENTHALER and H. SCHELLHAAS (*Ztschr. Untersuch. Nahr. u. Genussmtl., 25 (1913), No. 3, pp. 154–158*).—Instead of determining the presence of saponin by noting the hemolytic power, the authors recommend hydrolyzing this glucosid and testing for the cleavage products. This allows of the detection of nonhemolytic regenerated saponin. The method is as follows:

To the solution under examination add 2.5 cc. of hydrochloric acid, filter if a precipitate ensues, and evaporate the filtrate on a water bath until the solution ceases to foam. This indicates that the hydrolysis is complete. Then cool somewhat and shake the still warm solution with acetic ether, taking 50 cc. of acetic ether for each 100 cc. of aqueous extract. Wash the clear acetic acid solution with water until no reaction is obtained with silver nitrate, and evaporate to dryness. If the extract is highly colored, it can be decolorized before evaporation with animal charcoal.

The extract is used for two tests: (1) For prosapogenin with sulphuric acid. This gives an orange red coloration which slowly goes over to a cherry red and finally becomes violet. When small amounts are present this change in colors may take several hours. (2) To see if foaming takes place a little of the extract is dissolved in a small amount of sodium carbonate solution.

Beer can be tested by a modified form of the above procedure.

The determination of the acetyl number [of oils, fats, etc.], E. B. HOLLAND (*Massachusetts Sta. Bul. 151 (1914), pp. 69–78; Jour. Indus. and Engin. Chem., 6 (1914), No. 6, pp. 482–486*).—After reviewing existing methods for determining

the acetyl number of fats, it is pointed out that the acetyl number of a fat and of the insoluble acids affords valuable information relative to the nature and the quality of the product under examination, and a short and simple volumetric method is proposed which is free of many of the objectionable features of the Benedikt and Ulzer and Lewkowitsch methods.

"The development of the method extended over a period of several years and finally resolved into an adaptation of several well-known processes. Ceresin is used to solidify the acetylated fat so that it may be washed by decantation as in the determination of insoluble acids. The saponification number of the acetylated fat is determined by the same process as that of the original fat and the difference measures the amount of acetyl that has been assimilated."

A gravimetric method similar to the one described by Lewkowitsch is also given, but it is stated that it has not received sufficient study to warrant the drawing of definite conclusions.

The acetyl number in this work is defined as the number of milligrams of potassium hydroxid required for the saponification of the acetyl assimilated by one gm. of an oil, fat, or wax on acetylization. The prevalent custom of reporting the acetyl number on the basis of the acetylated product seems to be without foundation.

The estimation of citric acid in the presence of certain other acids, L. GOWING-SCOPES (*Analyst, 38 (1913), No. 442, pp. 12–19, fig. 1; abs. in Chem. Ztg., 37 (1913), No. 47, p. 480*).—The Beau modification of Denigès' method was studied and found unsatisfactory. Instead, a reagent composed of a mixture of mercuric nitrate, manganese nitrate, and nitric acid is recommended. The results obtained by the new method showed a maximum error of only +0.0003 and −0.0004 per cent. The presence of malic and lactic acids influences the results, but tartaric and succinic acids do not.

The use of sodium citrate for the determination of reverted phosphoric acid, A. W. BOSWORTH (*New York State Sta. Tech. Bul. 34 (1914), pp. 10–12; Jour. Indus. and Engin. Chem., 6 (1914), No. 3, pp. 227, 228*).—Previously noted from another source (E. S. R., 29, p. 795).

A new method for determining nicotin in the presence of ammonia, R. SPALLINO (*Gaz. Chim. Ital., 43 (1913), II, No. 4, pp. 493–500*).—This method is based on the fact that nicotin behaves toward picric acid as a diacid base in aqueous solutions and as a monoacid base in alcoholic solutions.

The method is as follows: From 1.5 to 3.5 gm. of tobacco is mixed with milk of magnesia and distilled with steam. The vapors are then collected in from 50 to 100 cc. of an aqueous solution of picric acid. After from 600 to 700 cc. of distillate is obtained it is diluted with 1 liter of alcohol and divided into two portions, which are separately evaporated to dryness. The residue from one of the portions is dissolved in alcohol and titrated with half-normal barium hydroxid solution against lacmoid. The other residue is then treated with water, made up to 100 cc. with water, filtered, and 75 cc. of the filtrate titrated with half-normal barium hydroxid. The difference between the titration of the alcoholic and aqueous residue solutions, when multiplied by 0.0081, gives the amount of nicotin present in grams.

Estimation of nicotin in the form of silicotungstate, R. SPALLINO (*Gaz. Chim. Ital., 43 (1913), II, No. 4, pp. 482–486*).—The author states that the gravimetric determination of nicotin as silicotungstate gives good results if the factor 0.1139 is used for calculating the nicotin content. If the procedure of drying, as suggested by Chapin (E. S. R., 25, p. 16), is followed, the results are discordant.

About the occurrence of nicotinic acid (m-pyridin carbonic acid) in rice bran, U. SUZUKI and S. MATSUNAGA (*Jour. Col. Agr. Imp. Univ. Tokyo, 5*

(1912), No. 1, pp. 59–61; abs. in Zentbl. Biochem. u. Biophys., 14 (1913), No. 22, p. 827).—This deals with the preparation of nicotinic acid from fat-free bran. About 1 gm. of acid per kilogram of bran was obtained.

Presence of barium and arsenic in tobacco, R. SPALLINO (*Gaz. Chim. Ital., 43 (1913), II, No. 4, pp. 475–481*).—The amount of barium in 3 samples of snuff and 3 samples of smoking tobacco dried at 100° C. varied between 0.019 and 0.036 per cent, calculated as barium sulphate. In 4 samples of smoking tobacco and 3 of snuff the arsenic ranged from 0.08 to 1.02 mg. per 100 gm. of dry substance. It is suggested that in purchasing tobacco its arsenic content may well be considered, since arsenicals are used extensively, especially in the United States, for spraying tobacco.

Effects of varying certain cooking conditions in producing soda pulp from aspen, H. E. SURFACE (*U. S. Dept. Agr. Bul. 80 (1914), pp. 63, pls. 9, figs. 20*).—"Although the soda process of wood-pulp manufacture is not employed commercially to so great an extent in America as the sulphite and mechanical processes, it is remarkably well adapted for producing pulp fibers from any kind of wood or other fibrous vegetable material, no matter how resistant to chemical attack it may be. For this reason it is much used in the experimental work of the Forest Service. . . .

"It was to secure and make available detailed information which would both facilitate other experimental work in the laboratory and promote the efficiency of commercial plants employing the soda process that the series of tests discussed in this bulletin was undertaken. They were carried out at the Forest Products Laboratory maintained by the Forest Service at Madison, Wis., in cooperation with the University of Wisconsin.

"The report of the experimental work is prefaced by a short description of the soda process and a review of previous investigations. Some general comments on aspen as a raw material for soda pulp and on the pulp itself are found in the appendix. This species of poplar was selected as the test material because it is the most important soda pulpwood. The information secured, however, is of much value also in connection with the cooking of other woods."

The practical results obtained, which are described and discussed, "show in detail the effect of certain cooking conditions on the yields and properties of the resultant pulp, on the efficiency of the cooking chemicals, and on various items affecting costs of production. From a study of these results it should be possible for a mill operator so to regulate the cooking process as to secure the largest possible yield of pulp of the desired quality at a minimum cost for chemicals, fuel, labor, and overhead charges in so far as the operation is affected by the cooking conditions considered.

"The clear, sound wood used in the experiments afforded yields of good pulp from 10 to 25 per cent higher than the better run of the yields reported by pulp mills. Moreover, some of these experimental yields were obtained with shorter cooking periods and less chemicals than are employed commercially. Although the laboratory results may not be equaled in mill practice, the possibility of greatly increased efficiency in the process of converting wood into soda pulp is indicated."

A bibliography is appended.

METEOROLOGY—WATER.

International catalogue of scientific literature. F—Meteorology (*Internat. Cat. Sci. Lit., 11 (1914), pp. VIII+245*).—"The literature indexed is mainly that of 1911, but includes those portions of the literature of 1901–1910 in regard

to which the index slips were received by the Central Bureau too late for inclusion in the previous volumes. There are also entries dated 1912."

Weather and water, M. HOFFMANN (*Jahresber. Landw., 28 (1913), pp. 1–20*).—Recent investigations on these subjects are classified and reviewed as usual.

Influence of forest cover upon local climate (*Quart. Jour. Roy. Met. Soc. [London], 40 (1914), No. 170, pp. 166–168*).—This is a brief review of a paper by G. A. Pearson previously referred to (E. S. R., 30, p. 417).

Influence of forest cover upon local climate, T. H. MORGAN (*Quart. Jour. Roy. Met. Soc. [London], 40 (1914), No. 171, p. 228*).—This is a brief note on the paper referred to above, calling attention especially to electrical differences that may be set up in passing from open land to forest.

The relation of forests in the Atlantic plain to the humidity of the Central States and prairie region, R. ZON (*Proc. Soc. Amer. Foresters, 8 (1913), No. 2, pp. 139–153, pls. 2*).—The author bases his conclusion that there is "a relation between the forests of the coastal plain and the southern Appalachians, on the one hand, and the humidity of the Central States and prairie region, on the other," on three fundamental considerations presents data upon these, as follows:

"(1) In the eastern half of the United States there is a marked perodicity in the wind direction. In winter the prevailing winds are from the north and northwest; in summer they are from the south. When the prevailing winds come from the south the entire eastern half of the United States is wet. When the prevailing winds are from the northwest and west the precipitation decreases. Therefore, the precipitation of the eastern half of the United States depends largely upon the prevailing southerly winds which come from the Gulf and penetrate far into the interior of the continent.

"(2) The evaporation from the ocean plays a comparatively unimportant part in the precipitation over the land; seven-ninths of the precipitation over land is supplied by evaporation over the land itself, and only two-ninths is furnished by the evaporation from the ocean. Therefore, the greater the evaporation from the land which is in the path of the prevailing southerly winds, the more moisture must be carried by them into the interior of the continent.

"(3) The forest evaporates more water than any vegetative cover and much more than free water surfaces. Therefore, forests enrich with moisture the winds that pass over them, and contribute to the humidity of the regions into which the prevailing air currents pass."

Restraining effect of forests on sudden melting of snow, J. E. CHURCH, JR. (*Engin. Rec., 69 (1914), No. 24, p. 674*).—Measurements are referred to which indicated that the protection of snow against rain and sun is directly proportionate to the density of the forest growth, and that the melting of snow is most rapid in open areas.

A method of estimating rainfall by the growth of trees, A. E. DOUGLASS (*Bul. Amer. Geogr. Soc., 46 (1914), No. 5, pp. 321–335, figs. 5*).—The results of studies of the rings of yellow pine trees near Flagstaff, Ariz., are correlated with past meteorological conditions, especially rainfall. The curves for the period of known rainfall show a close correlation with that for the tree growth. A certain correlation between tree growth, as shown by the rings, and climatic cycles is also indicated.

Distribution of drought, F. EREDIA (*Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 3, pp. 325–329*).—Following the suggestion of Broounoff that a knowledge of the distribution of the rainfall of a given region during 10-day periods may be used to advantage in adapting crops

to meteorological conditions, especially with reference to the critical periods of growth, the author gives calculations for Sicily of the frequency of 10-day periods of rainfall between 0.1 and 5 mm. and of 10-day periods without rain, and discusses the bearing of these data upon rain distribution and plant growth in Sicily. He is of the opinion that in a region like Sicily, which has distinct rainy and dry seasons, it is more important to know the occurrence of the rainy periods than the dry periods.

"An examination of the 10-day periods with a total rainfall of 5 mm. (0.2 in.) shows that different values must be attached to them, according to the time of the year at which they occur; that is to say, during periods of regular rainfall a 10-day period with a total of 5 mm. is really a dry period comparable to one having no influence on vegetation, while, on the other hand, if it occurred in a period of extreme dryness, e. g., during the summer months in Sicily, such a period could exercise considerable influence. It would appear, therefore, that the rainfall measurements would be more profitable if the probability of the period with low rainfall greater than 5 mm. were known, and also those of absolute drought."

Is the earth drying up? (*Quart. Jour. Roy. Met. Soc.* [*London*], *40* (*1914*), *No. 170, pp. 165, 166*).—This is a brief discussion of a paper by J. W. Gregory already noted (E. S. R., 30, p. 815), emphasizing especially the conflicting evidence and views upon this subject.

A study of the changes in the distribution of temperature in Europe and North America during the years 1900 to 1909, H. Arctowski (*Ann. N. Y. Acad. Sci., 24* (*1914*), *pp. 39–113, figs. 61*).—Following the procedure adopted in a previous paper dealing with temperature data for 1891 to 1900 (E. S. R., 23, p. 712) and considering the means for that decade as quasi-normal values, the author calculates for each year from 1900 to 1909 and for each station the departures from these means. Curves are presented showing these annual departures, the positive departures being designated thermopleions, the negative departures antipleions.

These curves show that the year 1900 was one of predominant thermopleions while in 1893 the antipleions strongly predominated. It is estimated that the difference in temperature between these two years must have been at least 0.5° C.

For the purpose of making the necessary comparisons the temperature curve of the exceptionally undisturbed climate of Arequipa, Peru, for the years 1900 to 1910 was taken as the standard. This curve shows four characteristic crests and four depressions for the period named.

The paper presents data to show "that in far distant regions of the globe, simultaneously with the appearance of the Arequipa crests pleions are formed; that these pleions have a tendency to persist; that, in order to persist, one must displace another. Pleions and antipleions are correlated; if one moves, the other moves. In North America the displacements seem to be confined to the North American Continent. In consequence, the pleions must pendulate from one side to the other. Moreover, the differences between the pleionian crests and the antipleionian depressions of temperature change. These changes of amplitude seem to be in immediate correlation with the equatorial changes of temperature. . . .

"The existence of macropleionian variations, the close correlation of the pleionian phenomenon with the Arequipa variation, the compensating antipleions, and, finally, the dynamic character of these climatic changes, eliminate . . . the hypothesis attributing such changes exclusively to the presence of variable quantities of volcanic dust in the higher layers of our atmosphere.

"Variations of the solar radiation must be the real and most important cause producing the changes of our climates and keeping them in a dynamic state."

The climate of Duluth, Minnesota, H. W. RICHARDSON (*Duluth, 1914, pp. 47, figs. 14*).—This publication, compiled by the local forecaster of the U. S. Weather Bureau, presents briefly the principal facts concerning the climate in the vicinity of Duluth and discusses the relation of the climate to the agricultural possibilities of the region.

A summary of meteorological records, J. E. OSTRANDER (*Massachusetts Sta. Bul. 153 (1914), pp. 117–146*).—In addition to summaries of observations on pressure, temperature, precipitation, humidity, cloudiness, wind, and casual phenomena made at the Massachusetts Station during the period from 1889–1913, inclusive, this bulletin includes records of such available and apparently reliable precipitation and temperature records as were made in Amherst previous to 1889, viz, those made by the late Prof. E. S. Snell of Amherst College and his daughters (1836–1883) and those made at the state experiment station under the direction of Dr. C. A. Goessmann (1883–1888).

The summary for the 25 years (1889–1913) shows that the maximum pressure reduced to freezing and sea level was 30.65 in. February 26, 1889; the minimum 28.24 in. February 8, 1895; the mean 30.012. The highest temperature recorded was 104° F. July 4, 1911; the lowest −26° January 5, 1904; the mean 47.5°. The mean dew-point was 39; the mean relative humidity 74.6. The greatest annual precipitation was 57.05 in. in 1897; the lowest 30.68 in. in 1908; the mean 43.76 in. Using all of the available data for temperature (1837–1913) and precipitation (1836–1913) it was found that the mean temperature was 46.9° F.; the mean annual precipitation, 44.17 in.

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. OSTRANDER and R. E. MCLAIN (*Massachusetts Sta. Met. Buls. 307, 308 (1914), pp. 4 each*).—Summaries of observations at Amherst, Mass., on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during July and August, 1914, are presented. The data are briefly discussed in general notes on the weather of each month.

Weather report, W. H. DAY (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 39 (1913), pp. 64–70*).—Observations on temperature and precipitation and on the length of the growing season at Guelph and at fourteen other places in Ontario during 1913 are summarized. A wind record for Guelph is also given.

Notes on the water of cranberry bogs, F. W. MORSE (*Massachusetts Sta. Bul. 150, pp. 62–68*).—Studies of the composition of ditch water and seepage water from small experimental bogs previously described were continued. (E. S. R., 28, p. 324).

It is estimated that the seepage water of the experimental bogs in 1913 contained more than 21 lbs. of nitrogen, 10 lbs. of phosphoric acid, and 50 lbs. of potash per acre. There appeared to be no direct relation between varying applications of fertilizers the previous year and the composition of the drainage water. There was, however, found to be a direct relation between free circulation of water and drainage and vine growth.

Bacillus coli in water supply, J. RACE (*Municipal Engin., 47 (1914), No. 1, pp. 12–14, figs. 3*).—The author gives a warning against the present tendency to minimize the value of the indication given by the presence of the *Bacillus coli communis* in water supplies. He emphasizes the fact that the presence of that organism in a sample of water, although not certain evidence that it is dangerously polluted, is a definite warning, which can not be safely ignored, that the water is polluted and that the source of the pollution must be determined and kept under close observation at all times to insure that it does not become dangerous.

SOILS—FERTILIZERS.

Soil management, F. H. KING (*New York and London, 1914, pp. XII+311, pls. 17, figs. 8*).—For many years before his death Prof. King had been assembling material for the preparation of a book on soil management. In this volume his widow, Mrs. C. B. King, "has brought together such of his papers and lectures as contain materials that he would have worked into an organized form."

An introductory chapter discussing the influence of good and bad management of soils on their productive capacity and emphasizing the value of scientific soil management is followed by a chapter explaining the principles governing the productive capacity of fields. In these sections the factors making for fertility are considered, and emphasis placed on the importance of soil composition and structure and moisture regulation. Separate chapters deal with the functions, availability, and conservation of soil moisture in crop production, soil moisture and plant feeding, and the principles and practice of earth mulches. Keeping in mind the importance of the conservation of soil moisture the author discusses the relations of optimum soil moisture capacity and soil texture, and points out the value of the use, where practicable, of straw, grass, litter, and earth mulches in particular for the conservation of soil moisture.

A further chapter explaining the beneficial effects of lime in soils is followed by a discussion of the physical features of soils which influence their ability to feed crops. Other chapters deal somewhat at length with the functions, conservation, and application of water in crop production and reclamation of swamp lands. A final chapter dealing with agricultural conditions in China, Korea, and Japan describes the methods of tillage, fertilization, and crop rotation practiced in those countries.

Guide to the scientific study of soils, F. WAHNSCHAFFE and F. SCHUCHT (*Anleitung zur wissenschaftlichen Bodenuntersuchung. Berlin, 1914, 3. rev. ed., pp. VIII+216, figs. 57*).—This is the third revised edition of this work (E. S. R., 15, p. 659), in which the authors have endeavored to incorporate more recent developments in methods of soil investigation.

Types of soil formation, their classification and geological distribution, K. GLINKA (*Die Typen der Bodenbildung, ihre Klassifikation und geographische Verbreitung. Berlin, 1914, pp. 365, pl. 1, figs. 65*).—In this volume, translated from the Russian, the author describes field and laboratory methods of soil investigation, and discusses especially the observations and conclusions of Russian investigators regarding the problems of soil genesis and the geography and physical and chemical properties of soil types and varieties, more particularly those encountered in European, Asiatic, and mountainous Russia. He discusses the objects and results of soil study, and considers the influence of climate on the origin of soil types to be of basic importance.

Several methods of soil type classification according to mechanical, physical, and chemical properties, geographical distribution, etc., are described, and the author finally divides the types and their variations into two classes which are formed either by external or internal forces, viz, ectodynamorphic and endodynamorphic soils.

Quantitative mineralogical analysis of sandy soil, A. VENDL (*Földtani Közlöny, 43 (1913), No. 7–9, pp. 331–343; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 3, p. 337*).—The use of a combination of microscopic and chemical analysis on a special type of sandy soil is described.

The inorganic composition of some important American soils, W. O. ROBINSON (*U. S. Dept. Agr. Bul. 122 (1914), pp. 27*).—This bulletin reports chemical and mineralogical investigations of certain important types of soils.

Chromium, vanadium, rare earths, zirconium, barium, strontium, lithium, and rubidium were present in all the soils examined. Chromium ranged from a trace to 0.025 per cent; vanadium, from 0.01 per cent to 0.08 per cent; rare earths, from 0.01 per cent to 0.08 per cent; zirconium, from 0.003 per cent to 0.08 per cent; barium, from 0.004 per cent to 0.36 per cent; and strontium, from 0.01 per cent to 0.11 per cent. Lithium was found in spectroscopic traces only. Boron was indicated in 18 soils by the presence of tourmalin and fluorin in 24 soils by the presence of micas.

Molybdenum was found in the surface soils of only two types and cæsium in only one soil. Neither the amounts nor even the presence of copper, nickel, and cobalt were established in the soils with certainty.

Silica, manganese, and phosphorus were found to concentrate in the surface soil, and aluminum, iron, potash, magnesium, and generally titanium, in the subsoil.

The sulphur content was low, ranging from 0.3 to 0.39 per cent of SO_3, with an average of 0.13 per cent.

An abundance of potash minerals was found in the soil, the amount varying from 43 to 2,000 tons to the acre of soil to a depth of 3 feet.

The evidence that soils contain the more important rock-forming minerals is said to be strengthened by the mineralogical examinations.

A colluvial soil and its people. F. V. EMERSON (*Bul. Amer. Geogr. Soc., 46 (1914), No. 9, pp. 655–658, fig. 1*).—An area in one of the Ozark counties of Missouri is described which consists of an old limestone plateau where the soil creep is said to cause accumulation of colluvial soils in a narrow belt near the foot of slopes. The colluvial soils vary from a clay loam to a silt loam and are said to be extremely important both because of their fertility and because of the scarcity of arable lands in the region. The possibility of increasing the area of very fertile soil by terracing is pointed out.

The occurrence of manganese in Kentucky soils and its possible significance. O. M. SHEDD (*Jour. Indus. and Engin. Chem., 6 (1914), No. 8, pp. 660–664*).—An examination of a large number of Kentucky soils showed that in a large majority of the cases there was considerably less manganese in the cultivated soils than in corresponding virgin soils. In practically every case the surface soil contained more manganese than the subsoil. The majority of the soils contained considerably more manganese than phosphorus, but many samples contained much less, while the losses of manganese in the cultivated areas were usually greater than of phosphorus.

"There are large differences in the manganese content of the soils of the different geological areas and sometimes in those from the same area. The amounts found in the surface soils vary from 0.005 to 0.331 per cent, and in the subsoils from 0.002 to 0.264 per cent. As a rule, the better agricultural areas contain much larger amounts of manganese than the inferior areas."

Report of the state agricultural chemist, J. H. PHILLIPS (*Rpt. Dept. Agr. So. Aust., 1912–13, pp. 27–30*).—Among a number of miscellaneous analyses are determinations of manganese in various soil samples, and of copper, lead, and arsenic in soil samples taken from under the drip area of fruit trees which have been sprayed for a number of years with various insecticides.

On osmosis in soils. The efficiency of the soil constituents as semipermeable membranes, C. J. LYNDE and H. A. DUPRÉ (*Proc. and Trans. Roy. Soc. Canada, 3. ser., 7 (1913), Sect. III, pp. 105–117, figs. 4*).—The investigations here reported have already been noted from another source (E. S. R., 30, p. 23).

On a new method of measuring the capillary lift of soils, C. J. LYNDE and H. A. DUPRÉ (*Proc. and Trans. Roy. Soc. Canada, 3. ser., 7 (1913), Sect. III, pp.*

119–129, figs. 3).—The investigations here reported have already been noted from another source (E. S. R., 30, p. 22).

The theory of antagonism of salts and its significance in soil studies. C. B. LIPMAN (*Proc. Soc. Prom. Agr. Sci., 34 (1913), pp. 33–40*).—A previous paper setting forth the same views has already been noted (E. S. R., 31, p. 317).

The deposits in drainpipes in drainage of swamp soil. B. TACKE (*Zentbl. Agr. Chem., 43 (1914), No. 5, pp. 308–311*).—Investigations of the incrustations in drainpipes in swampy soil showed that the trouble was due mainly to fine sand and clay separations which penetrated the drain joints. The reddish-yellow color was due to iron oxid. Most of the incrustation was found at the joints. The trouble was best prevented by covering the joints with peat muck.

Some chemical and bacteriological effects of clearing grass land by burning. F. QUISUMBING and G. OCFEMIA (*Philippine Agr. and Forester, 3 (1914), No. 4, pp. 76–78*).—It is stated that grass lands in the Philippines are commonly cleared by burning, but experiments are referred to which show that this practice results in a large loss of nitrogen and humus in the surface soil. A study of the bacterial life of the soil showed that burning not only greatly reduced the number of organisms in it, but profoundly modified their character. The work did not go far enough to show whether this was an advantage or disadvantage.

Mobilization of the soil phosphoric acid under the influence of the life activity of bacteria. S. SEVERIN (*Viestnik Bakt. Agron. Stantsii V. K. Ferrein, No. 18 (1911), pp. 156–246; abs. in Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 13 (1912), No. 4, pp. 629, 630*).—This is a detailed account of investigations more briefly reported elsewhere (E. S. R., 26, p. 817).

Enriching of soils in nitrogen in connection with the life activity of aerobic micro-organisms assimilating free nitrogen. A. V. KRAINSKIĬ (*Univ. Izv. [Kief], 52 (1912), Nos. 4, pt. 2, Art. 3, pp. 1–58; 8, pt. 2, Art. 3, pp. 59–131, figs. 7; 9, pt. 2, Art. 5, pp. 133–182, figs. 2; abs. in Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 13 (1912), No. 4, pp. 625–629*).—This elaborate report first reviews the literature, then describes the methods used by the author, and finally reports in detail the results of his investigations on the subject.

The biological nature of nitrogen fixation in soils was deduced from results of experiments with antiseptics (chloroform and thymol). The higher the humus content the larger the water content of the soil required for optimum nitrogen fixation. The mutual relations of different groups of organisms were affected by varying conditions of light. No nitrogen was fixed under strictly anaerobic conditions (in an atmosphere of nitrogen), although it occurred in a chernozem soil with high moisture content. There appeared to be a certain associative action of anaerobic and aerobic organisms.

Increasing the organic matter of the soil did not increase nitrogen fixation, but the organic matter was quickly decomposed. Nitrogen fixation was more active in naturally rich or well-fertilized soils than in poor soils. Azotobacter was shown to be capable of using carbohydrates, alcohol, and acids as sources of energy.

With an increase of aeration the amount of organic matter required to fix a unit of nitrogen diminished and the process of fixation was accelerated. In sand cultures the curve of respiration ran parallel with or lagged behind the curve of fixation. In water cultures it ran ahead. Ammonium sulphate depressed fixation of free nitrogen by Azotobacter. *Aspergillus niger* and *Penicillium glaucum* assimilated free nitrogen best in a 5 per cent sugar solution. The ratio of carbon consumed to free nitrogen assimilated was on the average about 10:1 in sand cultures. In soils with high contents of water

and organic matter it was much greater than this, while with soils with abundant aeration it was about the same as in sand cultures.

The influence of organic substances on nitrification and denitrification in cultivated soil, C. BARTHEL (*Meddel. Centralanst. Försöksv. Jordbruksområdet, No. 83 (1913), pp. 36, fig. 1; K. Landtbr. Akad. Handl. och Tidskr., 52 (1913), No. 8, pp. 599–632, fig. 1; abs. in Zentbl. Agr. Chem., 43 (1914), No. 6, pp. 372, 373*).—The author's experiments showed, in conformity with those of Winogradski and Omelianski (E. S. R., 11, p. 711), that in the presence of easily soluble organic matter nitrification does not take place until the organic matter is completely mineralized. For example, a small amount of dextrose not only hindered nitrification to a marked extent but strongly promoted denitrification, and nitrification did not occur until the dextrose was completely mineralized. A very small amount (0.1 per cent) of dextrose, however, produced the opposite effect, due probably to stimulating action.

The danger from the harmful effect of organic matter upon nitrification is not considered as great as the investigations of Winogradski and Omelianski would indicate, because soluble organic substances seldom occur in soils in large amounts. The conditions, however, are different in the manure heap, and this accounts for the feebleness or failure of nitrification there.

The course of nitrification in fallow soil, B. VELBEL (*Khutorŭanin, 1912, Nos. 10, pp. 12–18; 20, 22, 23, 24, pp. 26–28; abs. in Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 13 (1912), No. 5, pp. 717, 718*).—The experiments here reported indicated that the chief factor controlling nitrification in fallow soil was the humus and humus nitrogen content of the soil. Nitrification increased directly with the humus. The largest amount of nitrates observed in these experiments (2,137 lbs. per acre to a depth of 14 in.) was found at the beginning of August in a heavy clay chernozem containing from 8 to 10 per cent of humus in the surface soil. Nitrification was found to be greater in early fallow than in late. It was also increased by the cultivation of leguminous plants.

The first result of the application of manure was to produce a certain amount of denitrification, but later in the summer the nitrification was more rapid in manured soil than in unmanured soil, and the favorable effect of the manure was still noticeable after four years.

Green manuring experiment, 1912–13, C. M. HUTCHINSON and S. MILLIGAN (*Agr. Research Inst. Pusa Bul. 40 (1914), pp. 31, pl. 1, fig. 1*).—Field and laboratory experiments to determine the best stage of growth and methods of turning under green manures, with a special study of the relation of various conditions of soil, rainfall, supplementary fertilization, bacterial activity, etc., to the character of decomposition which takes place, are reported. The experiments were confined to one plant, namely, *Crotalaria juncea*.

The results indicated that water was probably the controlling factor in the decomposition and nitrification of green manure in soil. It was found that three-eighths saturation of the soil was the optimum moisture content for nitrification of the green manure under the conditions prevailing in these experiments. The best results were obtained by turning under the plant while it was still green and succulent. With plants 4 weeks old 67 per cent of the nitrogen was nitrified, while with plants 10 weeks old only 34.5 per cent of the nitrogen was nitrified. The optimum depth of burying the green manure varied with the age of the plant and probably with the character of the soil and its subsequent treatment, but in general the more mature the plant the less the depth to which it should be plowed under in order to insure nitrification. The optimum moisture content, 16 per cent, for carbon dioxid formation was the same as that for nitrification of the green manure. The addition of superphosphate promoted the decomposition of the green manure.

How to improve our heavy clay soils, A. R. WHITSON, E. J. DELWICHE, and F. L. MUSBACK (*Wisconsin Sta. Bul. 202, rev. (1914), pp. 3–16, figs. 5*).—This is a revised edition of this bulletin (E. S. R., 25, p. 19).

Ways of improving our sandy soils, A. R. WHITSON, F. J. SIEVERS, and H. W. ULLSPERGER (*Wisconsin Sta. Bul. 204, rev. (1914), pp. 3–27, figs. 11*).—This is a revised edition of this bulletin (E. S. R., 25, p. 19).

Dry farming in Washington, C. C. THOM and H. F. HOLTZ (*Washington Sta. Popular Bul. 69 (1914), pp. 31, figs. 6*).—This is a popular bulletin for farmers and new settlers.

Soils, M. HOFFMANN (*Jahresber. Landw., 28 (1913), pp. 21–54*).—This is a classified review of recent reports of investigations on this subject.

Fertilizers and fertilizing, M. HOFFMANN (*Jahresber. Landw., 28 (1913), pp. 54–99*).—A classified review is given of recent reports of investigations.

Outline of the function and use of commercial fertilizers, E. O. FIPPIN (*New York Cornell Sta. Circ. 23 (1914), pp. 21–28*).—A brief popular discussion of the subject.

Fertilizers in Central America, J. E. VAN DER LAAT (*Los Abonos en Centro América. San Jose, Costa Rica, 1914, pp. 53, figs. 6*).—The need of fertilizers on tropical soils is emphasized, and information regarding the nature and use of fertilizers suited to the crops and soil of this region is given.

Fertilizer for south China, A. E. CARLETON (*Daily Cons. and Trade Rpts. [U. S.], 17 (1914), No. 214, p. 1494*).—It is stated that the trade in fertilizers in China has not materially increased in recent years, but that the prospects favor an improvement in the future. The total value of manures and fertilizers of all kinds imported into China during 1913 was $700,872. This included among other things various natural manures, bird guano, bean oil cake, sodium nitrate, and ammonium sulphate, the latter mainly for use on rice.

Absorption of fertilizer salts by Hawaiian soils, W. MCGEORGE (*Hawaii Sta. Bul. 35 (1914), pp. 32*).—A chemical study of the absorptive power of different types of Hawaiian soils for phosphoric acid, potash, and nitrogen in different forms is reported in this bulletin.

The fixation of phosphoric acid was found to be much higher than that of other elements, due to the highly basic character of the soil. Apparently the fixation of potash and ammonium nitrogen was controlled largely by the amounts of lime and magnesia present in the soil. The absorptive power of the soil for nitrate nitrogen was found to be almost negligible except in the case of highly organic soils. Drying the soil had but slight effect upon its fixing power. The results indicate that fertilizer salts are more strongly fixed when applied singly rather than in mixtures. The effect of heat and antiseptics on the absorptive power of soil was not very striking and the results were not very consistent. The removal of the absorbed elements approached a constant quite rapidly in the case of potash and ammonium salts, but more slowly in that of the phosphates.

Soil tank experiments, S. E. COLLISON (*Florida Sta. Rpt. 1913, pp. XCVIII–CII*).—Experiments with fertilizers for citrus trees were continued as in previous years (E. S. R., 29, p. 211) in two series of four tanks each, the data for composition of the drainage obtained from the tanks during the year being tabulated without comment. Brief notes are also given on the character of the season, especially the rainfall, and on the growth of the trees.

Nitrification of organic manures, J. W. PATERSON and P. R. SCOTT (*Jour. Dept. Agr. Victoria, 12 (1914), No. 6, pp. 321–329, figs. 2*).—In continuation of previous experiments on the relation of moisture and certain soil constituents to nitrification (E. S. R., 28, pp. 217, 720), a study was made of the

rate of nitrification of dried blood, ground bone, leather, oat straw, and alfalfa hay, each added at the rate of 0.1 gm. of nitrogen with 0.75 gm. of calcium carbonate to 300 gm. of sandy soil.

Two rates of moisture were maintained in different series, (1) 5.35 per cent calculated on the dry soil, or 20 per cent of the water-holding capacity of the soil, and (2) 16.05 per cent, or 60 per cent of the water capacity. The soils were placed in bottles which were kept in a dark cupboard. They were corked to prevent evaporation but were aspirated twice weekly to renew the air.

Determinations of ammonia and nitrate nitrogen were made at the beginning of the experiments and at the end of 34 and 123 days. The mean temperature of incubation was about 70° F.

The results showed that in the case of the more active fertilizers the nitrogen was promptly ammonified and passed readily into the form of nitrates. Taking the sum of the ammonia and nitrate nitrogen to represent available nitrogen, it was found that four-fifths of the nitrogen of blood and bone was converted into available form within four months under suitable conditions of moisture and temperature. About 50 per cent of the nitrogen of alfalfa was also made available in four months. Only 1.36 per cent of the nitrogen of leather became available in that time, and this occurred only under the more moist conditions of soil. There was an actual loss of available nitrogen in the case of oat straw.

On the composition and value of bat guano, C. F. Miller (*Jour. Indus. and Engin. Chem., 6 (1914), No. 8, pp. 664, 665*).—Analyses of samples of bat guano from various sources are reported and discussed.

In these samples the nitrogen varied from 0.5 to 11.84 per cent, phosphoric acid from 1.08 to 4.8, and potash from 0.21 to 1.61. The results show wide variations not only in the percentages of the fertilizer constituents but also in their ratios to one another. In general, in the more recent deposits nitrogen is the most valuable constituent, phosphoric acid and potash following in the order given, but on aging the nitrogen content decreases very rapidly. Over 90 per cent of the phosphoric acid present was found to be water soluble, as was also the greater part of the potash.

The origin of nitrate deposits, W. H. Ross (*Pop. Sci. Mo., 85 (1914), No. 2, pp. 134–145; Amer. Fert. 41 (1914), No. 6, pp. 40–46*).—The occurrence of nitrate deposits in different parts of the world is described and the various theories which have been advanced to explain their origin, particularly as found in Chile, are reviewed.

Among the theories to which attention is called are (1) that the nitrates have resulted from electric storms, (2) that the atmospheric nitrogen has been fixed by alkali carbonates in the presence of oxidizable matter, (3) that the nitrates have resulted from the action of radio-active emanations from the soil, (4) that the nitrates have been derived from seaweed, bird guano, or the manure of vicuñas and llamas, (5) that the deposits represent accumulations of nitrate formed by the oxidation of organic matter in the soil of the great plain lying between the nitrate beds and the Andes and washed down to their present location by periodic floods, and (6) that the nitrates have been formed by the direct fixation of the nitrogen of the air by Azotobacter and like organisms as suggested by Headden.

The author concludes, however, that not one of these theories "is adequate to account for all the conditions under which the deposits are found, and it seems most probable, as some have suggested, that instead of being formed in one way only, the nitrates owe their origin to several sources."

Growth in Chilean nitrate industry, A. A. Winslow (*Daily Cons. and Trade Rpts. [U. S.], 17 (1914), No. 165, p. 305*).—The industry is stated to be growing and prosperous.

Ammonium sulphate and sodium nitrate in 1913 (*Jour. Indus. and Engin. Chem., 6 (1914), No. 8, p. 693*).—Statistics of production are briefly summarized.

It is stated that the world's production of ammonium sulphate in 1913 was 1,365,700 tons, of which Germany produced 549,000 tons, the United Kingdom 420,000 tons, the United States 177,000 tons, and France 75,400. The production of Chilean nitrate was 2,450,000 tons in 1913 as against 2,552,770 tons in 1912.

Recent increase in production of lime nitrogen, C. KUBIERSCHKY (*Jour. Indus. and Engin. Chem., 6 (1914), No. 8, p. 692*).—Statistics of production since the beginning of the industry are briefly reported.

The estimated production of cyanamid in 1914 is 208,000 tons. It is stated that the average annual increase in the production of cyanamid from 1907 to 1912 was 212 per cent, of Norwegian nitrate from 1903 to 1911, 170 per cent, while the increase of Chilean nitrate from 1901 to 1911 was only 6.8 and of ammonium sulphate in the same period 10.5 per cent.

Lime nitrogen and its use, B. SCHULZE (*Deut. Landw. Presse, 41 (1914), No. 62, p. 761*).—In comparative tests of sodium nitrate and of oiled, granulated, and untreated lime nitrogen on white mustard grown in pots it was found that the oiled lime nitrogen was practically as efficient as the untreated, being from 85 to 91 per cent as efficient as sodium nitrate. The granulated lime nitrogen, however, was much less effective than the oiled or untreated material, being only 66 per cent as efficient as sodium nitrate.

The author urges the use of high-grade lime nitrogen as it is more likely to be free from dicyandiamid and to be more efficient than low-grade material.

Solubility of nitrogen compounds of lime nitrogen in water, C. MANUELLI (*Ann. Chim. Appl. [Rome], 1 (1914), pp. 412, 413; abs. in Jour. Soc. Chem. Indus., 33 (1914), No. 13, p. 690*).—It was found, as reported in this article, that about 80 per cent of the nitrogen of lime nitrogen was dissolved in water at 13 to 14° C. in one hour and 88 per cent in six hours. Beyond that point solution began to diminish.

Transformation of calcium cyanamid into ammonia, C. MANUELLI (*Ann. Chim. Appl. [Rome], 1 (1914), pp. 388–396; abs. in Jour. Soc. Chem. Indus., 33 (1914), No. 13, pp. 690, 691*).—When about 100 gm. of crude calcium cyanamid was heated in water in an autoclave for 6 to 8 hours at from 170 to 180° C. 90 per cent of the theoretical amount of the nitrogen was obtained, and this proportion could be increased by using one-tenth of the amount of cyanamid or repeating the treatment.

Commercial possibilities of the process are discussed.

The origin, mining, and preparation of phosphate rock, E. H. SELLARDS (*Bul. Amer. Inst. Mining Engin., No. 93 (1914), pp. 2379–2395, figs. 3*).—This article deals with Florida and Tennessee phosphates. Substantially the same information in part has already been noted from other sources (E. S. R., 25, p. 121; 30, p. 222).

The importance of the adoption of less wasteful methods of mining and preparing phosphate for market and of devising processes by which lower grades of phosphate may be used in the manufacture of superphosphate is especially emphasized.

Tennessee phosphate practice, J. A. BARR (*Bul. Amer. Inst. Mining Engin., No. 93 (1914), pp. 2397–2413, figs. 12*).—Methods of mining the brown and blue phosphate rock and preparing it for the market, and manufacturing superphosphate, are described and discussed.

Coral phosphate islands of the Pacific Ocean and their products, C. ELSCHNER (*Corallogene Phosphat-Inseln Austral-Oceaniens und ihre Produkte. Lübeck, Germany, 1913, pp. 120, pls. 31; abs. in Bul. Amer. Geogr. Soc., 46 (1914), No. 9, p. 691*).—This monograph deals particularly with the geology and chem-

istry of the phosphates of certain of the Pacific islands, especially Nauru and Paanapa but also of Angaur and Makatea of the Palau and Tuamotu groups. These are all islands of upheaval and the phosphate is more or less advanced in chemical and pressure changes. A chapter is also given on the following guano islands of recent formation: Baker, Howland, Phoenix group, Sydney, Malden, Starbuck, Christmas, Fanning, Flint, Jarvis, Browse, Lacepède, Laysan, Cornwallis, and Clipperton.

German potash supply (*Daily Cons. and Trade Rpts. [U. S.], 17 (1914), No. 208, p. 1261*).—The imports of potash salts into the United States during the fiscal year ended June 30, 1914, are stated to have been as follows: Kainit 541,846 tons, manure salts 261,342, muriate of potash 237,916, and sulphate of potash 45,139, the total being 1,086,243 tons valued at $15,160,123, as compared with 882,562 tons valued at $12,484,576 in 1913.

It is stated that the only outlet for German potash during the European war is through the Netherlands, which on August 31 temporarily lifted the embargo on the exportation of potash.

The deep boring at Spur, J. A. Udden (*Bul. Univ. Tex., No. 363 (1914), pp. 109, pls. 16, figs. 18*).—The agricultural interest in this boring centers about the fact that analyses of water obtained at different depths indicate the presence of a potash-bearing stratum somewhere near 2,200 ft. below the surface. A sample of the water obtained at about this depth contained 324.1 gr. per gallon of potassium chlorid.

Experiments on the effect of liming agricultural soils, A. Botto and D. N. Guglielmetti (*Rev. Facult. Agron. y Vet. La Plata, 2. ser., 10 (1914), No. 3, pp. 85–124*).—It is demonstrated that the effects of liming on soils of Argentina which are poor in lime are to correct physical defects, to increase chemical decomposition, to favor the activity of soil organisms, to render plant food, particularly phosphoric acid, more soluble, and to further indirectly the assimilation of plant food by crops such as alfalfa.

The lime requirements of moor and similar soils which are poor in lime, B. Tacke (*Jahrb. Moork., 2 (1913), pp. 1–22*).—The author reviews and discusses the results of a number of experiments by himself and others showing particularly the unfavorable effects of excessive liming on moor and similar soils under different conditions. He points out that upland moor soils growing hay and root crops need, and are able to endure, a much smaller quantity of lime than meadow and pasture soils, the quantity required depending on the condition of decomposition and acidity of the moor soil and the crop to be grown. For north German conditions it it considered inadvisable to apply lime in excess of 1,780 lbs. per acre to soil growing hay and root crops, while on meadows and pastures at least twice that amount is necessary.

The effectiveness of lime fertilizers when applied to acid soil is said to depend largely on its degree of fineness.

It is further concluded that on sand and moor soils, poor in lime, the effect of liming is usually very lasting, and that liming should be repeated only when the necessity for it is indicated by comparative tests.

The production of lime in 1913, R. W. Stone (*U. S. Geol. Survey, Mineral Resources of the United States Calendar Year 1913, pt. 2, pp. 309–324*).—"The lime manufactured in the United States in 1913 amounted to 3,595,390 short tons, valued at $14,648,362. This was an increase of 65,928 tons, or 1.87 per cent, in quantity and of $678,248, or 4.85 per cent, in value, when compared with the output for 1912, which was 3,529,462 short tons, valued at $13,970,114. The production in 1913 was the largest in the history of the industry, both in the quantity manufactured and in the value of the output. . . . The total

number of plants reporting operations in 1913 was 1,023 as compared with 1,017 in 1912 and with 1,139 in 1911."

The influence of sulphur on soil acidity, H. C. LINT (*Jour. Indus. and Engin. Chem., 6 (1914), No. 9, pp. 747, 748*).—Laboratory experiments on the rate of oxidation of sulphur in soil to which it had been added to the amount of 1,000 lbs. per acre-foot showed that the sulphur had practically all been oxidized within the first eight or nine weeks, there being little change in the acidity after the seventh week. The oxidation of sulphur was much more rapid with a heavy clay loam soil than with a sandy loam soil. Soils made up to 20 per cent water content once each week and allowed to dry did not give as rapid oxidation as those in which an optimum moisture content of 20 per cent was constantly maintained by keeping the soils covered to prevent drying out.

That the sulphur causes an increase in acidity under field conditions is verified by analyses of field soils to which sulphur had been applied the previous year. These showed the lime requirement to correspond to the rate of sulphur application.

Fertilizer and oils, B. W. EVERMANN (*U. S. Dept. Com., Bur. Fisheries Doc. 797, pp. 134, 135; abs. in Amer. Fert., 41 (1914), No. 6, p. 28*).—This is a short section in a larger report on the Alaska fisheries and fur industries in 1913. It deals briefly with the status of fish fertilizer and oil production in Alaska, which is stated to have been less extensive than during the previous year, emphasizes the great waste of valuable fertilizing material at the canning factories, and describes particularly a new plant for the manufacture of fertilizer and oil established at Klawak during the year.

Commercial fertilizers, J. S. BURD (*California Sta. Bul. 245 (1914), pp. 53*).—Guaranties, analyses, and valuations of 498 samples of fertilizers inspected by the California Fertilizer Control during the year ended June 30, 1914, are reported. Ninety-one of these fertilizers were deficient in one or more fertilizing constituents under the terms of the state fertilizer law which allows a deficiency of 0.25 per cent in nitrogen, 0.5 in potash, and 1 in available phosphoric acid. The sales of fertilizers in the State during the year are estimated at from 35,000 to 40,000 tons.

Fertilizer analyses, H. B. MCDONNELL ET AL. (*Md. Agr. Col. Quart., No. 65 (1914), pp. 39*).—Analyses and valuations of fertilizers sold in Maryland examined from February to July, 1914, are reported.

AGRICULTURAL BOTANY.

[The evolutionary aspects of genetic research], W. BATESON (*Nature [London], 93 (1914), Nos. 2338, pp. 635–642; 2339, pp. 674–681; Science, n. ser., 40 (1914), Nos. 1026, pp. 287–302; 1027, pp. 319–333*).—This is the presidential address delivered before the British Association for the Advancement of Science at its Australian meeting in August, 1914, in which the author outlined his ideas regarding evolution in the light of recent research in genetics.

It is claimed that variation in a series must occur either by the addition or loss of a factor. Of the origin of new forms by the loss of a factor there is said to be abundant evidence, but there does not appear to be any clear evidence of the contemporary acquisition of new factors. The author summarizes his views as follows: "As the evidence stands at present all that can be safely added in amplification of the evolutionary creed may be summed up in the statement that variation occurs as a definite event often producing a sensibly discontinuous result; that the succession of varieties comes to pass by the elevation and establishment of sporadic groups of individuals owing their origin to

such isolated events; and that the change which we see as a nascent variation is often, perhaps always, one of loss."

The second part of the paper is devoted to the development of his conclusions in regard to man.

Physiological plant anatomy, G. HABERLANDT, trans. by M. DRUMMOND (*London, 1914, pp. XV+777, figs. 291*).—This work is a translation of the fourth German edition which appeared in 1909, and is considered as representing the mature views of the author. The scope of the work may be shown by the definition given to physiological plant anatomy: "It consists first, in the recognition of the physiological functions pertaining to the tissues of the plant and to the structural units, or cells, of which these tissues are composed; and secondly, in the discovery of the connection that exists between the several functions and the anatomical arrangements required for their proper performance."

Chapters are given on the cells and tissues of plants, meristematic tissues, and dermal, mechanical, absorbing, photosynthetic, vascular or conducting, storage, aerating or ventilating, secretory and excretory, motor, sensory, and stimulus transmitting systems. A chapter is also given on the secondary growth in thickness of stems and roots causing both the normal and anomalous forms.

By means of copious notes additional data are given to support various statements, and controverted points are discussed at some length. This book will undoubtedly be a noteworthy addition to the available literature in the English language relating to the general field of the physiology of plants.

On chlorophyll and leaf pigments and those of flowers and berries, R. WILLSTÄTTER (*Naturwissenschaften, 2 (1914), No. 19, pp. 468–470*).—This is a brief note of a paper read before the German Chemical Society.

It is stated that the composition of chlorophyll is largely independent of season, time of day, and illumination, also that the composition of the particular pigments involved varies but slightly. The characteristic coloring matter of the cornflower is thought to be identical with that of the rose and to have as a basis some potassium compound.

Winter as a factor in the xerophily of certain evergreen ericads, F. C. GATES (*Bot. Gaz., 57 (1914), No. 6, pp. 445–489, figs. 12*).—The author, giving results of work carried on from 1910 to 1912, states that the transpiration of all plants tested was very low in winter, often being imperceptible at night. A gain of weight occurring at low temperatures indicated absorption, in some cases sufficient to overbalance transpiration. Transpiration per unit surface of evergreen shrubs was from 4 to 30 times that of deciduous shrubs during cold winter weather, also under warm indoor conditions.

In case of peat bog plants in nature, light, particularly sunlight, seems to be the effective factor in causing stomatal movements. These appear to be less influential in regulating transpiration of peat bog plants than the evaporating power of the air.

Thermotropism in roots, H. D. HOOKER, JR. (*Plant World, 17 (1914), No. 5, pp. 135–153*).—Summarizing conclusions reached from details obtained in nine experiments on thermotropism as carried out with seedlings of Ervum, Pisum, Phaseolus, Lupinus, and Zea sprouting in agar, the author states that the use of a 1.25 per cent solution of agar as a medium for the roots effectually excludes all factors except the difference of temperature, but allows the roots to grow and bend; that no thermotropic reactions occur when such agar is used; that reactions occurring in such cases must be attributed to positive hydrotropism; and that traumatropism enters as a factor at higher temperatures.

The solvent action of roots, F. V. CHIRIKOV (*Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 15 (1914), No. 1, pp. 54–65*).—As the result of experiments carried out with barley and buckwheat in nutritive media, the author concludes that the excretion of acids by roots is inadequate to explain a number of facts noted in connection with the nutrition of the higher green plants. Roots of such plants are surrounded by a solution which is in a certain state of equilibrium. Roots of different plants disturb the equilibrium in the medium in very unlike ways, absorbing predominately calcium oxid or phosphorous pentoxid, as the case may be, and the relations of these plants to phosphorus pentoxid must differ considerably. Barley does not take up phosphorus pentoxid in the presence of calcium nitrate or other calcium salt, but it may utilize phosphoric acid from phosphorite alone in considerable degree. Buckwheat behaves differently, taking up phosphorus pentoxid from phosphorite in either the presence or absence of calcium nitrate. This difference is explained on the supposition that buckwheat takes up, from the nutritive solution, calcium oxid more energetically than phosphorus pentoxid, while in case of barley, phosphorus pentoxid is much more energetically taken up than is calcium oxid.

Some factors which influence the water requirements of plants, P. KHANKHOJE (*Jour. Amer. Soc. Agron., 6 (1914), No. 1, pp. 1–23, fig. 1*).—These experiments were carried out in order to ascertain more in detail some of the factors influencing the water requirements of cereals, standard methods being employed.

It is stated that different kinds of crops require different amounts of water to produce a unit of dry matter. Increased strength of soil solution decreases water requirement. A fertile soil with limited water supply will produce a larger crop than will an infertile soil under similar conditions. Young plants require more water than older plants. Plants furnished with excessive water come to require more water per unit of dry matter than do plants grown in drier soils.

The relation of atmospheric evaporating power to soil moisture content at permanent wilting in plants, J. W. SHIVE and B. E. LIVINGSTON (*Plant World, 17 (1914), No. 4, pp. 81–121, figs. 5*).—The authors, giving a detailed account of their investigations, state that these have substantiated the claim of Caldwell (E. S. R., 29, p. 523) to the effect that the amount of water left in any given soil at the time of permanent wilting of plants is a function of the intensity of atmospheric evaporating power for the period during which permanent wilting is attained. They further hold that the conclusion reached by Briggs and Shantz (E. S. R., 26, p. 628; 27, p. 223), to the effect that the atmospheric and environmental conditions that obtain during the process of wilting have little or no effect upon the residual water content here considered, and that this soil moisture residue for any given soil remains constant for all species of plants grown in it and for various stages of development, can not be considered as of general application but only as expressing a relation obtaining under some as yet undetermined range of external and internal conditions within which must have lain the experimental conditions employed by these workers.

Acidity of manures as related to germinability of seeds of leguminous weeds, O. MUNERATI and T. V. ZAPPAROLI (*Staz. Sper. Agr. Ital., 46 (1913), No. 1, pp. 5–17*).—Field and laboratory tests were made with seeds of *Vicia segetalis*, *V. hirta*, and *Lathyrus aphaca* from 2 to 6 years old in contact for different periods with acid phosphate of varying strength. It was found that long contact and strong solutions both corresponded with the progressive diminution of germinability of the seeds. This result is thought to be related to an increase in permeability of the seed coats.

The formation and regulation of enzyms by some mold fungi, H. KYLIN (*Jahrb. Wiss. Bot. [Pringsheim], 53 (1914), No. 4, pp. 465–501*).—The author, giving a detailed account with results of several series of studies involving the activity of *Aspergillus niger*, *Penicillium glaucum*, and *P. biforme* as regards formation and regulation of diastase, invertase, and maltase, states that two sorts of regulation may be distinguished, namely a qualitative (in which an enzym is formed only when a particular substance is present in the nutritive solution) and a quantitative (when an enzym may be formed under different conditions, but most favorably and in increasing quantity when a component is present which is readily broken up by the enzym in question). A bibliography is appended.

Physical and chemical factors influencing the toxicity of inorganic salts to Monilia sitophila, L. O. KUNKEL (*Bul. Torrey Bot. Club, 41 (1914), No. 5, pp. 265–293, figs. 2*).—In extension of work previously reported (E. S. R., 30, p. 227), the author studied the influence of carbohydrates and peptones on the toxicity of 11 different chlorids in five different media, using as before cultures of the fungus *M. sitophila*.

The results are tabulated and discussed. It is claimed that in studies on toxicity the organic part of the medium must be taken into account.

A bibliography is appended.

The behavior of hydrocyanic acid when injected into plants, S. DEZANI (*Arch. Farmacol. Sper. e Sci. Aff., 16 (1913), No. 12, pp. 539–546*).—Claiming to have found previously that hydrocyanic acid injected into plants was probably broken up by reaction with substances in the plant juices, one of the products thereof being ammonia, the author experimented with minute doses of the acid in question injected into maize and hemp, and holds that direct proof of its utilization was indicated by the results observed.

Increase of heliotropic sensitivity of seedlings by narcotics, O. RICHTER (*Sitzber. K. Akad. Wiss. [Vienna], Math. Naturw. Kl., 121 (1912), I, No. 10, pp. 1183–1228, pl. 1, figs. 3*).—Describing experiments under varied conditions with seedlings of cereals, etc., the author claims that the heliotropic sensitivity of the plants employed was increased by exposure in a narcotic medium.

The harmful action of distilled water, R. H. TRUE (*Amer. Jour. Bot., 1 (1914), No. 6, pp. 255–273, fig. 1*).—Presenting details of studies with plants in distilled or tap water or in various solutions, previously noted (E. S. R., 30, p. 825), the author considers it probable that the problem of injury by distilled water to contained cells is not a simple one capable in all cases of the same explanation. Besides cases of toxic substances derived from containers, etc., other cases remain unaccounted for. Extraction of electrolytes by distilled water from the cells is regarded as but a special case of a type of injury done to cells by unbalanced solutions. Calcium salt added to distilled water to make it osmotically equivalent to tap water protects the chemical integrity of the cells in some way not yet known. Further work is now in progress.

A bibliography is appended.

Poisoning of trees on streets by gas, P. EHRENBERG (*Ztschr. Pflanzenkrank., 24 (1914), No. 1, pp. 33–40, figs. 2*).—In the case of linden trees dying on both sides of a street in the middle of a block in Hanover, no parasites could be detected, but a break was found in the gas main in the center of the street. The gases seemed to have percolated beneath the asphalt and were thought to have produced the effects observed. Better ventilation of the space around the trees is suggested.

Studies on smoke injury, S. EICKE (*Naturw. Ztschr. Forst u. Landw., 12 (1914), No. 5, pp. 201–207, figs. 5*).—Presenting graphically the results of studies on the growth of pines up to 52 years old as affected by gases from

industrial works, the author states that pines, especially the younger ones in the neighborhood, showed a progressive diminution in growth, attributable to gas and smoke.

Soil bacteriology, C. M. HUTCHINSON (*Rpt. Agr. Research Inst. and Col. Pusa, 1912–13, pp. 85–90*).—This is a part of the more general report of the bacteriologist, and deals, as the principal subject of inquiry, with the nitrogen supply in the soil as affected by the intervention of bacteria.

Azotobacter was found in all Indian soils examined, pure cultures exhibiting nitrogen-fixing power very similar to that from European strains, and its physiological activity depending upon the supplies of water, air, lime, and especially of carbohydrate food. Successful use of a green manure crop was found to depend almost entirely upon the rainfall after turning under the crop. Field experiments with green manure in 1912–13 showed no increase from the plats tested, but in some cases a decided falling off. The nitrate formed from buried tissues increased for eight weeks provided the soil water supply was kept up to at least 16 per cent, but decreased thereafter.

A new medium for the quantitative determination of bacteria in soil, H. J. CONN (*Science, n. ser., 39 (1914), No. 1012, pp. 763, 764*).—As a result of comparative tests of an asparaginate agar containing chemicals of known composition, a soil extract gelatin, and three special media for soil work proposed by Fischer (E. S. R., 22, p. 723), and by Lipman and Brown (E. S. R., 22, p. 723), the asparaginate agar is highly recommended. "The only medium which seems better, either in respect to count or to the colony differentiation, is soil-extract gelatin; and because of the addition of soil extract this gelatin is not one that can be readily duplicated. The only one of the media investigated which gives a higher count than either of these is Fischer's soil-extract agar, which does not allow good colony differentiation."

Flora of southeastern Washington and adjacent Idaho, C. V. PIPER and R. K. BEATTIE (*Lancaster, Pa., 1914, pp. XI+296, pl. 1*).—This is an extension of the flora of the Palouse Region published by the authors in 1901 (E. S. R., 13, p. 620). The area covered by this new edition has been enlarged so as to include about a half dozen counties of eastern and southeastern Washington and parts of three counties in Idaho. The list of species given is 1,139, an increase of 476 over that of the previous publication.

Mistletoe in Great Britain and Ireland, C. VON TUBEUF (*Naturw. Ztschr. Forst u. Landw., 12 (1914), No. 5, pp. 211–214*).—This is a brief discussion with a list of occurrences of mistletoe on oaks in England from 1857 to the present time.

Mistletoe in England, W. SOMERVILLE (*Naturw. Ztschr. Forst u. Landw., 12 (1914), No. 5, pp. 207–211*).—This is a condensed account of observations by 15 persons reporting from as many places in England on cases of parasitism, natural or artificially induced, by mistletoe on various hosts named, with a list of trees which appear not to be attacked.

FIELD CROPS.

[Field experiments], J. M. SCOTT (*Florida Sta. Rpt. 1913, pp. XIX–XXVI*).—In a four-year fertilizer experiment with Japanese cane, the use of sulphate of potash gave an average increased yield of 0.9 ton per acre over that of muriate of potash; sulphate of ammonia an increased yield of 1.1 tons per acre over dried blood; dried blood and muriate of potash an increased yield of 1.56 tons per acre over muriate of potash and acid phosphate; ground limestone an increase of 2.99 tons per acre; and dried blood and muriate of potash an increase of 3.19 tons per acre over dried blood and acid phosphate. There was

a marked decrease in yield in all plats from the first to the fourth year. Similar results were obtained in another test.

The results of a three-year cultivation test showed a yield of 14.97 tons of green Japanese cane per acre with 2-in. depth of cultivation. This was an increase of 1.36 tons over that with 4-in. and 6-in. depths.

Velvet beans grown on the same land for six years showed an irregular decrease in yield of beans from 25.13 bu. per acre to 9.63 bu.

A variety test of sweet potatoes for 1912 showed Unknown to be the heaviest yielder of commercial potatoes, 148.75 bu. per acre, with Porto Rico Yam and Triumph closely following.

One year's test showed sweet potatoes to be a desirable silage crop, keeping in perfect condition and eaten by cattle and hogs readily. Cassava silage also gave good results. Both crops were ensiled in the ordinary way.

Culture experiments at the experiment field at Bromberg in 1913, G. RICHTER (*Mitt. Kaiser Wilhelms Inst. Landw. Bromberg, 6 (1914), No. 3, pp. 143–191, pl. 1, figs. 6*).—This reports weather conditions from 1907–1912 and irrigation results on sandy and on heavy soils with rye, grass, beans, cabbage, tomatoes, fruit, sugar beets, stock beets, and turnips, and data as to the water condition of the soils.

It is noted that irrigation proved satisfactory, that one application proved best, that with an application of 130 mm. of water an increased yield of 1,450 kg. of dry matter per hectare was obtained over no irrigation while an application of 180 mm. did not materially increase the yield, that none of the irrigation experiments were profitable, that the proportion of grain to straw was increased by irrigation, and that kernel weight increased with irrigation. A table showing the amount of water necessary to produce 1 kg. of winter rye on sandy soil follows:

Amount of water necessary to produce 1 kg. of winter rye on sandy soil.

Rain, April to June, per hectare.	Irrigation water applied per hectare.	Rain and irrigation water per hectare.	Yield of rye per hectare.	Water used to produce 1 kg. of crop.	
				As harvested, 15 per cent water.	Water-free.
Cubic meters.	*Cubic meters.*	*Cubic meters.*	*Kilograms.*	*Kilograms.*	*Kilograms.*
1,200	.....	1,200	6,140	196	230
1,200	300	1,500	6,110	246	289
1,200	1,300	2,500	7,590	330	387
1,200	1,800	3,000	7,800	385	452

A brief résumé is given of the effect of adding humus to sandy soils in 1908–1912 with oats, potatoes, and rye.

Cultivation of east Prussian low moorlands.—I, Report of the experiment fields on the overflowed moors of the Bledau estate near Cranz, FELDT (*Veröffentl. Preuss. Landw. Kammern, No. 1 (1914), pp. 90, pls. 12*).—This discusses methods of drainage and cultivation suitable for such soils and gives some results of cultural and variety tests with cereals, beans, potatoes, and vegetables.

Report on the Cawnpore Agricultural Station in the United Provinces for the year ended June 30, 1913, B. C. BURT ET AL. (*Rpt. Cawnpore [India] Agr. Sta., 1913, pp. 33+6a, figs. 5*).—This report includes results of experiments with artificial manures, calcium cyanamid, calcium nitrate, and green manures; variety tests with cotton, pigeon peas, great millet, sugar cane, peanuts, maize,

wheat, flax, and potatoes; and cultural experiments with cotton, wheat, sugar cane, indigo, peanuts, pigeon peas, millet, and crop rotations.

Report of the experimental work of the Coimbatore Agricultural Station, 1912–13, R. C. Wood (*Dept. Agr. Madras, Rpt. Coimbatore Agr. Sta., 1912–13, pp. 40*).—This report gives results of cultural, manurial, and variety tests with rice, sorghum, wheat, cumbu (*Pennisetum typhoideum*), millet, cotton, tobacco, sugar cane, fiber and oil plants, and legumes.

Report of the experimental work of the Koilpatti Agricultural Station for 1912–13, H. C. Sampson (*Dept. Agr. Madras, Rpt. Koilpatti Agr. Sta., 1912–13, pp. 20*).—This report gives results of cultural and manurial tests of cereals, legumes, and cotton, and an account of the local agricultural conditions.

Experiments with different sized plats, Schneidewind (*Mitt. Deut. Landw. Gesell., 29 (1914), No. 21, pp. 298–300*).—This article gives first-year results of using plats of different sizes and shapes placed contiguous and with unused space between them in fertilizer tests with sugar beets.

Experiments on germinative ability and germinative force, Gisevius (*Fühling's Landw. Ztg., 63 (1914), No. 9, pp. 297–318*).—This article gives tabulated data on results of germinative tests with oats, barley, rye, and wheat.

A study of the root system of our agricultural plants, B. Schulze (*Festschrift 50. Jubiläum Agr. Chem. Versuchs u. Kontroll Stat., Breslau, pp. 67–95, pls. 10*).—Results obtained by washing out the roots of plants grown in concrete apartments in the field reaching to a depth of 2 meters below the surface of the soil are tabulated in detail.

The relation of tops to roots of plants taken at different stages of development is given in length and weight, respectively, as follows: Rye, young, 100:826 and 100:104; rye, in early spring, 100:321 and 100:48.6; rye, beginning to flower, 100:133 and 100:21.1; rye, in milk stage, 100:112 and 100:10.1; rye, mature, 100:135 and 100:4.7; wheat, young, 100:684 and 100:129; wheat, in early spring, 100:502 and 100:47.2; wheat, shooting, 100:369 and 100:27.8; wheat, milk stage, 100:188 and 100:10.5; wheat, mature, 100:159 and 100:9.2; barley, mature, 100:259 and 100:7.4; oats, mature, 100:173 and 100:9; peas, mature, 100:90 and 100:3.4; beans, mature, 100:100 and 100:38.9; lupines, at end of vegetative period, 100:404 and 100:41.3; serradella, in flower, 100:281 and 100:20.2; red clover, young, 100:444 and 100:37.5; vetch, 10:185 and 100:15.7; potatoes, 100:380 and 100:41.4; and sugar beets, length only, 100:461.

Serological study of Leguminosæ and Gramineæ, Zade (*Ztschr. Pflanzenzücht., 2 (1914), No. 2, pp. 101–151, figs. 4*).—This article describes a method of distinguishing varieties of plants that involves a precipitin reaction (E. S. R., 29, p. 144) in which the serum of rabbits is used in connection with a liquid prepared from the meal of the grain to be tested and sodium chlorid (1:10).

Results obtained with varieties of peas, clovers, oats, and wheat, which were not altogether conclusive, are given.

The efficiency of leguminous plants in increasing the nitrogen content of the soil, V. C. Bartolome (*Philippine Agr. and Forester, 3 (1914), No. 1, pp. 9–14*).—This article reports results of comparative tests of peanuts, sincamas (*Pachyrrhizus erosus*), velvet bean, cowpea, sinay bean (*Phaseolus calcaratus*), soy bean, and Ami bean (*Glycine hispida*) as nitrogen gatherers. It is noted that sincamas gave the largest net profit, followed by sinay and cowpeas.

The behavior of oats and lupines toward different sources of phosphorus, T. Pfeiffer and E. Blanck (*Landw. Vers. Stat., 84 (1914), No. 1–2, pp. 93–118*).—Results are here given of numerous experiments in which oats and lupines were fertilized with dicalcium phosphate, phosphate rock, superphosphate, Thomas slag, and bone meal in pots. The oats utilized dicalcium phos-

phate, superphosphate, and Thomas slag to better advantage than lupines. Phosphate rock seemed to be an equally good source for both oats and lupines, but bone meal seemed to furnish phosphoric acid to the lupines better than to the oats. Although oats apparently use more water than lupines, the appropriations of phosphorus by the plants could not be explained on that basis. The fact that the more difficultly soluble compounds were more readily used by the lupines seemed to indicate that the acids of the root sap played an important part in the assimilation. Applications of ammonium nitrate did not cause an increase in the phosphoric acid with the lupines, while the reverse was true with the oats.

Report of assistant botanist, J. Belling (*Florida Sta. Rpt. 1913, pp. CIV–CXXVI, figs. 8*).—This reports work in continuation of that previously noted (E. S. R., 29, p. 228) on the selection of useful beans from the cross of Florida Velvet (*Stizolobium deeringianum*) and Lyon (*S. niveum*). Three selected constant strains are described, followed by discussions of precautions in breeding work, and general sources of error.

In a study of the inheritance of purple color four distinct parts of the plant are considered. On the lower epidermis of the first pair of apparently simple leaves; on the stem as a mark on the leaf axil; in the wings of the flower and to a less degree, in the standard; and on stems and petioles, on the sides exposed to sunlight. In several generations the purple and nonpurple colors were found to mendelize.

In regard to time of flowering it is noted that "a definite proof of segregation of some kind having occurred is found in the raising of constant strains of different degrees of earliness in F_3 and later generations. I have, in F_5 of the cross of the Florida Velvet by Lyon, several strains constant in flowering period, of which: (A) one flowers two months before the Florida Velvet or Lyon beans; (B) another flowers one month before; (C) a third flowers a week or two weeks before; while (D) a fourth flowers with the Florida Velvet bean; and (E) a fifth was over a month later in F_3 than the Florida Velvet or the Lyon bean. These strains (except the last) have been grown on a field scale in F_5, and have proved uniformly constant to time of flowering. As only one F_2 plant later than the Velvet bean has been multiplied in F_3 (except in the elimination field), we might perhaps expect several constant grades of later plants also. The black plants (with black tomentum all over) which segregate in normal Mendelian manner, and from three-sixteenths of F_2, are always later than the corresponding white plants (with white pubescence) in the F_3 families in which they occur in the normal proportion of three white to one black. Hence I regard the isolation of these five races constant to different degrees of earliness as a proof of the segregation of genetic factors affecting earliness and lateness in the microspores and megaspores of the F_1 hybrids." It was found that "the time of first flowering is in most cases a reliable indication of the climax of flowering and of the time of ripening pods."

A study of earliness and size of plant showed a strong correlation between time of flowering and size of plant, especially for the white plants, and purple plants with white shoots were slightly earlier than the nonpurple.

In regard to flower bunches the number of flower clusters (nodes) on a raceme is determined for any plant by the time of flowering (that is, indirectly by the factors for late flowering), and, independently of the time of flowering, by the presence or absence of a genetic factor. There was evidently a strong correlation between lateness of flowering and increased length of flower bunches.

Progress in crossing several varieties of corn is noted.

Alfalfa, W. P. BROOKS (*Massachusetts Sta. Bul. 154 (1914), pp. 143–171, pls. 2*).—This bulletin considers alfalfa as a crop for Massachusetts farmers; gives results of experiments with manure and potash as fertilizers, a comparison of different methods of seeding, and a test of a commercial culture for inoculation; and discusses methods of the production and management of the crop.

In conclusion it is noted that "a heavy application of lime is in almost all cases necessary, usually, from 1½ to 2½ tons at least. On soils which are low in humus and relatively poor, one good application of manure plowed in is beneficial, but in general, fertilizers should be preferred to manure because less likely to bring in weeds, grasses, and clovers. The best source of potash for the crop is sulphate, and one of the best sources of phosphoric acid is basic-slag meal. The Grimm variety is superior.

"Among the principal obstacles to success are leaf spot or rust, which can be prevented by cutting when it first appears; dodder, which can be avoided by care in the purchase of seed; the competition of weeds, grasses, and clovers, which is reduced by avoiding manures or fertilizers rich in nitrogen; and winterkilling, which is due to poor drainage, formation of ice, and insufficient growth for protection.

"The method of seeding attended with least risk is sowing alone in late summer after most careful preparatory tillage. The crop should be cured with little exposure to direct sunshine and little handling to avoid loss of leaves. It is a mistake to sow alfalfa in fields infested with witch grass. The growth of weeds, grasses, and clovers can be largely prevented by harrowing after the first or second cutting of any season when they are first present in noticeable proportion. Annual top-dressing with slag meal and potash will in most cases be desirable."

Cultivation of carrots with cereals, E. GRABNER (*Wiener Landw. Ztg., 64 (1914), No. 23, pp. 208, 209, figs. 2; abs. in Jour. Bd. Agr. [London], 21 (1914), No. 2, pp. 149*).—The results here given show successful crops of carrots grown in 1912 and in 1913 when seed was planted in the winter wheat during April.

Lea's cotton book, compiled by J. J. LEA (*New Orleans, La., 1914 ed., pp. 124, figs. 6*).—This book gives a record of climatological conditions affecting the growth and culture of the American cotton crop; a statistical history; a summary of the rules of the New Orleans Cotton Exchange; and data on the cotton milling industry, the cotton ginning industry, weights and values of lint cotton, seed cotton, cotton seed, and cotton picking.

The pollination and fertilization of hops and the characteristics of "seeded" and "seedless" hops, E. S. SALMON (*Jour. Bd. Agr. [London], 20 (1914), No. 11, pp. 953–966, pls. 3, figs. 7; 21 (1914), Nos. 1, pp. 22–31, pls. 4, fig. 1; 2, pp. 123–133, pls. 2; 3, pp. 23–220, fig. 1*).—This article discusses the history of hop production and cultural and marketing methods, and presents evidence to show the value of planting male hops in the hop fields in order that the size and quality of the product may be improved by fertilization of the flower.

Hop manuring experiments.—Brief report for 1913, with summary of the eighteen years 1896–1913, B. DYER (*London, 1914, pp. 4*).—This leaflet briefly brings up to date the results of the continuous hop manuring experiments carried on at Golden Green, Hadlow, Tunbridge, showing the average of the results of 18 seasons, together with the detailed results of the crop of 1912–13.

A plat receiving, aside from a complete commercial fertilizer, additional applications of nitrate of soda consisting of 200 lbs. in January, 400 lbs. in February, and 200 lbs. in March, is recorded as giving the largest average yield, 16¾ cwt., of the best quality of hops.

Fertilizers for hops, W. CZERMAK (*Illus. Landw. Ztg., 34 (1914), No. 24, pp. 239, 240*).—Experiments conducted during 1911–1913 in Posen in which equal quantities of potash and superphosphates were applied, and ammonium sulphate in ratios of 1, 2, 3, and 4, showed an increased yield of hops with each increase of the ammoniacal fertilizer.

The kapok tree, A. ZIMMERMANN (*Pflanzer, 10 (1914), No. 3, pp. 123–133*).—This article gives a botanical, cultural, and industrial discussion of *Ceiba pentandra*.

Botanical origin and usefulness of kapok fiber, GERTRUD TOBLER-WOLFF (*Pflanzer, 10 (1914), No. 4, pp. 171–175*).—This article includes a description of the kapok tree and its fiber. Among the uses to which this fiber has been put are mentioned the manufacture of paper, guncotton, fuses, tassels, fringes, and hats.

Market conditions of kapok, F. TOBLER (*Pflanzer, 10 (1914), No. 4, pp. 175–180*).—This article gives the exports of this fiber from Java as increasing from 5,750,000 kg. in 1906 to about 10,000,000 kg. in 1911. The market classification given comprises "extra clean," "good clean," and "clean."

Valuations are given for the markets of Java, Calcutta, Bombay, Ceylon, Philippines, Ecuador, Venezuela, Mexico, and Togo, which range from 100 to 170 marks per 100 kg. (10.4 to 17.8 cts. per pound).

Potato development work in Wisconsin (*Wis. Potato Growers Assoc. Bul., 1914, pp. 62, figs. 46*).—This bulletin gives reports on the progress of potato growing in the several sections of Wisconsin by different authors; the minutes of the 1913 meeting of the Wisconsin Potato Growers Association; and a summary of important addresses and papers presented at that meeting, with a plan of potato seed inspection for Wisconsin in 1914.

Potato storage work in Bihar and Orissa in 1912, E. J. WOODHOUSE and H. L. DUTT (*Agr. Jour. Bihar and Orissa [India], 1 (1913), No. 2, pp. 115–137, pl. 1*).—This article notes the success of storing potatoes under a layer of sand to prevent the damage of the potato moth.

Report of the Hmawbi Agricultural Station for the year 1912–13, A. MCKERRAL (*Rpt. Hmawbi [India] Agr. Sta., 1912–13, pp. 8*).—This report gives results of variety, cultural, and manurial tests with rice.

Variety test with stock beets, K. VON RÜMKER, J. ALEXANDROWITSCH, ET AL. (*Landw. Jahrb. 45 (1913), No. 4, pp. 503–596, figs. 6*).—Yields of dry matter and of sugar in numerous experiments with a large number of varieties are reported. Considerable space is also given to methods of computing comparative values.

The influence of fertilizers on the mineral and sugar content of beets, D. MEYER (*Illus. Landw. Ztg., 34 (1914), No. 8, pp. 59–61*).—Some results of experiments at Halle are noted in which a complete fertilizer seemed to more than double the potash content of sugar beets, while the tops were considerably richer in potash than the tops of stock beets. Stock beets were shown to store large quantities of sodium in the roots, while the sodium of the sugar beets was found almost entirely in the tops. Chlorin was found in very small quantity in the roots of sugar beets while much was stored in the tops. The stock beet roots contained about 10 times as much chlorin as did the sugar beet roots, and the tops also contained more than the tops of the sugar beets. The ash content was found to be higher in the stock beets. The above-mentioned differences are attributed to the results of selection and breeding.

Among the effects of different fertilizer elements noted are that no noticeable increase of potash in beet roots through fertilization by potash or by barnyard manure had been observed, but large quantities have been found stored in

the tops. Sodium nitrate or barnyard manure as fertilizers did not appreciably increase the sodium content of the roots, but large quantities were found in the tops. No increase in the chlorin content of the roots could be detected whether it was furnished in potassium salts or in barnyard manure, but it was found in the tops. The ash content was not noticeably influenced by fertilizers.

Nitrogenous fertilizers are not deemed favorable to sugar production. Applications of nitrate of soda reduced the sugar content 0.14 per cent and ammonia salt 0.08 per cent, while lime nitrogen was without effect.

Experiment on the development of sugar in beets, M. LEVALLOIS (*Bul. Assoc. Chim. Sucr. et Distill., 31 (1914), No. 11, pp. 903–909*).—Analyses of beets taken at intervals during the second season's growth (the seed producing stage) showed a general decline in sugar content from April 15 (18.7 per cent) to December 10 (2.37 per cent).

Handling and planting of seed cane, A. P. ADRIANO (*Philippine Agr. and Forester, 3 (1914), No. 2, pp. 41–49*).—This article gives results of experiments in cultural methods with some Philippine varieties of cane.

In comparing the methods of planting cane slanting or flat in the furrow it was found that flat planting gave the best results, being less subject to any injury and better withstanding drought. Cane planted 50 cm. (19.5 in.) in rows 1½ meters (59 in.) apart gave heavier yields, 32,857 kg. per hectare (14.62 tons per acre) than when planted 30 cm. in rows 60 cm. apart (18,571 kg.).

A test in planting tops, middles, and butts of the cane showed that "tops may be grown successfully when planted at once after cutting even if not soaked at all. In all the tests made tops which were not soaked in water and those soaked in water did better than the other thirds of the cane. Butts may be planted to advantage if soaked in water for 48 hours."

A depth of 12 in. in planting gave better results than that of 6 in.

Report of experiment of the Banjumas division of the experiment station of the Java sugar industry for 1913 (*Arch. Suikerindus. Nederland. Indië, 22 (1914), No. 13, pp. 441–498, pls. 3; Meded. Proefstat. Java-Suikerindus., 4 (1914), No. 21, pp. 413–467, pls. 3*).—This contains results with sugar cane as to yields and quality of sugar with different fertilizers on several classes of soil.

The cultivation of the sugar cane in southern Spain (*Roy. Bot. Gard. Kew, Bul. Misc. Inform., No. 4 (1914), pp. 147–150, fig. 1*).—This article suggests variety and cultural methods for that region.

Queensland sugar industry (*Brisbane: Govt., 1913, new ed., pp. 172, pl. 1, figs. 109*).—This book gives cultural methods and general notes on cost of production and manufacture, including statistics.

Sudan grass as a forage crop, H. N. VINALL (*U. S. Dept. Agr., Farmers' Bul. 605 (1914), pp. 20, figs. 10*).—This bulletin describes Sudan grass, discusses climatic and soil requirements, gives methods of culture and harvest, and notes its usefulness as a hay, soiling, silage, and pasture crop, its value in irrigated sections and as a seed crop, enemies, and methods of breeding.

"The yields vary from 1 to 8 tons of cured hay per acre. Its seed habits are good, and large returns are now being secured from the seed produced. The seed of Sudan grass resembles very closely that of Johnson grass; therefore farmers should use seed only from regions free from Johnson grass. It promises to fill a long-felt want for a hay grass in the South, and will likely replace millets as a catch crop in the Central and Eastern States. It does not do well in sections having a high altitude, because the nights are generally cool. There seems to be a place for it in irrigated regions as a forage to mix with alfalfa hay. Chinch bugs and grasshoppers, among insects, and the red-spot disease are its greatest enemies."

Fertilizers for tobacco, TRICHEREAU (*Jour. Agr. Prat., n. ser., 27 (1914), No. 22, pp. 691–693*).—Results of two years' trials show the profitableness of using a potassic fertilizer (sulphate of potash) for tobacco.

Field experiments with wheat, M. H. REYNOLDS (*Agr. Gaz. N. S. Wales, 25 (1914), No. 1, pp. 1–20*).—In rotation experiments for the years 1907–1912, inclusive, wheat grown continuously produced an annual average yield of 16.8 bu. per acre, wheat alternated annually with bare fallow averaged 24.8 bu., and wheat alternated annually with a fodder crop averaged 26.4 bu. In testing the value of burning the straw, plowing the straw under, or removing the straw with the binder, average yields, respectively, of 23.5, 22.6, and 22 bu. per acre were obtained.

"In the continuous wheat section the application of manure is shown to be most beneficial, its relative value increasing as the yield from the unmanured portion decreases. The best return is obtained from the complete manure, followed closely by the combination of phosphoric acid with potash, and of phosphoric acid with nitrogen. Superphosphate alone gives a substantial increase of one-third over the six years of the test, while the results from potash alone and in conjunction with nitrogen, are slight. The use of nitrogen has resulted in a return lower than that of the check plats.

"In the 'wheat after bare fallow" section, the increases throughout are slight, the best return being given by phosphoric acid and potash, followed, a long way after, by the complete manure. Superphosphate alone has a slight influence for good, while potash and nitrogen alone both yield lower returns than the unmanured portion. In the 'wheat after fodder crop' the best returns are also given by phosphoric acid and potash, followed closely by phosphoric acid alone and the complete manure. Nitrogen, in combination with phosphoric acid, is also of considerable benefit, while the effects of the others may be considered negligible."

A case of correlation in wheat, W. H. PARKER (*Jour. Agr. Sci. [England], 6 (1914), No. 2, pp. 179–181*).—In this article the author notes a high correlation between the total length of the rachis and the average internode length (obtained by dividing the length of the rachis in millimeters by the number of internodes of the straw). The coefficient of correlation is given as +0.9099 in the case of a square head variety of wheat. A correlation table is given.

On various treatments for the disinfection of seeds, T. BOKORNY (*Biochem. Ztschr., 62 (1914), No. 1–2, pp. 58–88*).—Experiments testing the efficiency of various treatments of seeds of barley, lentils, white beans, cabbage, and cress are described.

The treatments considered effective were immersing the seed at the boiling point for one-half minute in 0.1 per cent solution of copper sulphate, 1 per cent acetic acid, or 1 per cent solution of soda (crystals); immersing for 1 minute in 96 per cent alcohol at either 15° C. or the boiling point; treatment with alcoholic solution of potash (50 cc. of 30 per cent potash solution and 50 cc. of 96 per cent alcohol) at 15°; and one-half minute treatment with alcohol solution of hydrocloric acid (50 cc. of 96 per cent alcohol and 50 cc. of crude HCl).

The treatments that the author considers inefficient were immersion at air temperature in copper sulphate solution, alcoholic solution of formaldehyde, alcoholic carbolic acid solution, alcoholic acetic acid, or acetic acid; treatment with 0.5 per cent of copper sulphate at 60°; one-half minute treatment at the boiling point with either 2 to 10 per cent copper sulphate or 0.1 per cent permanganate solution; or 2-minute treatment with boiling water.

Cooperative experiments in weed eradication, J. E. HOWITT (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 39 (1913), pp. 46, 47*).—This notes successful methods employed by farmers under the direction of the college. The use of

rape destroyed perennial sow thistle and twitch grass. A method of cropping and cultivation also destroyed and exterminated twitch grass.

Destruction of chickweed in vineyards, P. Hoc (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 35 (1914), No. 24, pp. 755–758*).—This article records the successful treatment of chickweed (*Stellaria intermedia*) with a 5 per cent solution of copper sulphate, 5 per cent solution of sulphuric acid, 15 per cent solution of iron sulphate, and dehydrated iron sulphate. The last-named applied at the rate of from 400 to 500 kg. per hectare (356 to 445 lbs. per acre) was exceptionally efficient.

Wild garlic and its eradication, F. J. Pipal (*Indiana Sta. Bul. 176 (1914), pp. 43, pls. 8, figs. 17*).—This bulletin describes a successful method of eradicating wild garlic (*Allium vineale*) from large areas by the use of orchard-heating oil, a by-product of the fractional distillation of rock oil. This oil was used as a mist spray at the rate of 75 gal. per acre in the absence of a growing crop, before the plants have begun to form heads (April 15 to May 1 in southern Indiana), and supplemented by cultivation in the fall to sprout the bulbs and grow the tops to the proper size for the spring spraying. The bulletin treats also of the distribution, description, propagation, life history, conditions of growth, and dissemination of wild garlic.

The cost of the oil is noted as varying from 2.1 cts. to 6.75 cts. per gallon. Of many sprays and other methods, the above described was the only one that was entirely effective.

Experiments to destroy the vitality of the garlic bulblets in seed wheat by soaking first in cold water then in hot water at 126 to 129° F. indicated that a large percentage of the garlic bulblets can be killed in this way. Treating seed wheat with the orchard heating oil and in some cases heating the oil indicated that the treated bulblets can be killed by heating them for three hours at 125° F., but there are difficulties in subsequently drying the grain.

Wild onion: Methods of eradication, H. R. Cox (*U. S. Dept. Agr., Farmers' Bul. 610 (1914), pp. 8, figs. 7*).—This describes this weed and suggests a method of eradication, consisting essentially of a late fall plowing of infested field followed in the spring by a cultivated crop to prevent the wild onion from growing.

On the destruction of wild mustard, Haag (*Württemb. Wchnbl. Landw., No. 20 (1914), pp. 326–330*).—The use of iron sulphate (800 liters of 20 per cent solution per hectare), calcium cyanamid 150 kg. per hectare, kainit 1,000 kg. per hectare, and a mixture of calcium cyanamid 50 kg. and kainit 500 kg. per hectare, is reported as successful in the destruction of wild mustard and related plants in fields of oats, barley, and wheat. It is noted that the liquids made a more satisfactory material, they being cheaper, easier to apply, and more uniformly applied than the salts.

HORTICULTURE.

Asparagus culture and exploitation, H. Miatello (*Bol. Min. Agr. [Buenos Aires], 17 (1914), No. 5, pp. 530–619, pl. 1, figs. 81*).—A treatise on asparagus with reference to its history, botany, culture, exploitation, diseases and insect pests, and uses. A bibliography is appended.

Five oriental species of beans, C. V. Piper and W. J. Morse (*U. S. Dept. Agr. Bul. 119 (1914), pp. 32, pls. 7*).—In this bulletin the authors describe five annual species of Asiatic beans that at various times have been introduced into the United States but concerning which very little definite information has been published. They are the adsuki bean (*Phaseolus angularis*), the rice bean (*P.*

calcaratus), the mung bean (*P. aureus*), the urd (*P. mungo*), and the moth bean (*P. aconitifolius*). The beans are considered with reference to their botany and history, distinguishing characters, yields, and uses in their native countries. They are also compared with other similar legumes and notes are given on previous introductions into this country, together with chemical analyses of the hay and seeds.

A bibliography of cited literature is included.

Onion culture, O. M. MORRIS (*Washington Sta. Popular Bul. 66 (1914). pp. 4*).—A brief popular treatise on onion culture.

Recent investigations on solanaceous grafts, L. DANIEL (*Rev. Hort. [Paris], 86 (1914), No. 6, pp. 135–138, figs. 4*).—A study of direct and reciprocal grafts between various species of Solanum, such as the pepper, tomato, eggplant, etc., leads the author to conclude that many of the physiologic troubles of plants commonly considered as diseases are in reality due to the employment of antagonistic stocks and scions.

Top grafting of fruit trees, O. M. MORRIS and C. B. SPRAGUE (*Washington Sta. Popular Bul. 67 (1914), pp. 8, figs. 13*).—This contains popular directions for top grafting fruit trees by the following methods: Cleft grafting, saw kerf grafting, bark grafting, budding, and bridge grafting.

Winter sprays: Sulphur-lime wash and crude oil emulsions, A. L. MELANDER (*Washington Sta. Popular Bul. 64 (1914), pp. 8*).—This contains popular directions for the control of orchard pests by winter spraying with lime-sulphur washes and crude oil emulsions, including data as to their preparation.

Report on insecticides and fungicides licensed, inspected, and analyzed during the year 1913, S. K. JOHNSON (*Agr. Com. Ohio, Off. Rpt. Nursery and Orchard Insp., 1913, pp. 31–64*).—This comprises a report of the work for 1913 on the inspection and analysis of insecticides and fungicides under the Ohio insecticide and fungicide law, the text of which is given.

Reports on experimental work in connection with cranberries, H. J. FRANKLIN (*Massachusetts Sta. Bul. 150 (1914), pp. 37–62*).—The author here presents a full report on the work of the cranberry substation at Wareham for the year 1913 (E. S. R., 31, p. 441).

Weather records are being secured at the substation and at various other bogs with the ultimate aim of making more satisfactory frost predictions. Observations of barometric changes with respect to their influence on frost conditions in the Cape Cod region have shown a need of a more thorough knowledge of barometric conditions in the eastern Provinces of Canada. The U. S. Weather Bureau is planning to take such observations. An overhead irrigation system was tested on a small scale for drawing frost out of the cranberry vines by applications of cold water before sunrise. The sprayed areas afterward appeared to show more frost injury than did the surrounding unsprayed portions of the bog and such irrigation systems are also undesirable from the standpoint of expense. In lieu of a better method of frost protection, attention is directed to the practice of sanding the bogs as used with good results at the Wisconsin Station (E. S. R., 28, p. 838).

The work with fungus diseases was continued on the experimental plats in cooperation with the U. S. Department of Agriculture (E. S. R., 30, p. 143) and a number of spraying tests were carried on by growers. As in previous years the spray plats were treated in part with Bordeaux alone and in part with Bordeaux for early sprayings and neutral copper acetate for the last application. The tabulated results show a marked falling off in yield of the sprayed plats as compared with the surrounding untreated portions of the bog. It is suggested that the vigorous vines resulting from the control of fungus diseases in previous years may have seriously reduced the supply of available

plant food. A fertilizer test conducted on one of the sprayed plats resulted in an improved yield and indicates that vines which have borne a large crop through reduction of fungus diseases are in need of an extra supply of plant food the following year to maintain their vigor. Some evidence was obtained which indicates that the best time for applying fertilizers in order to increase the yield of fruit may be at about the blossoming period. An unexpected result of the spraying was the killing of the wood moss on all of the fungus plats. No marked difference in color was observed between the berries from the sprayed plats and their checks. The size of berries of the Howe variety was somewhat reduced on the sprayed plats as compared with berries from the check plats. Data on the keeping of berries from the sprayed plats and their checks indicate in a general way that the sprayed fruit holds up better under storage, although this result is more marked with some varieties than with others.

Three new fungus plats were started on the station bog in 1913. One of these plats was sprayed with lime-sulphur and the others with Bordeaux early in the season and with neutral copper acetate late in the season. One of the latter plats consisted of one-half of the fertilizer plat, in order to determine the combined effect of fertilizer and fungus spraying. As compared with the checks all of the sprayed plats gave a reduced yield of fruit. The fruit sprayed with Bordeaux and neutral copper acetate kept better in storage than the fruit from the check plats; whereas both the yield and keeping quality of fruit from the lime-sulphur plat was inferior to the fruit from the check plats. Thus far it appears that lime-sulphur is not a good cranberry fungicide and that Bordeaux may have an injurious effect on the setting of fruit if applied during the blooming period. The new disease "blossom end rot" (E. S. R., 30, p. 143) was prevalent in 1913, especially with the Howe variety.

In June tests were begun looking for the control of fungus diseases by applying copper sulphate in the flowage. As indicated by the yields and keeping quality of the fruit, the copper sulphate treatment was neither beneficial nor injurious. Investigations looking to the development of improved varieties were continued and samples of berries of most of the varieties grown in the Cape Cod region have been collected.

In the bee pollination experiments the plats from which bees were screened out during the blooming periods of 1911 and 1912 yielded fruit in 1913 at the same rate as the surrounding bog. A new exclusion plat, approximately 0.5 sq. rod in area, was established in 1913, and the yield on this plat was reduced to 2¾ qt. as compared with about 1 bu. on any equal unscreened adjoining plat.

On the cranberry fertilizer plats there was a general reduction in yield as compared with the check plats, but the decrease was slight except on the nitrate of soda plats where there was a marked drying up of the blossoms and small berries, which has thus far been unexplained. The fertilizers failed to show any marked effect on the keeping quality of the fruit except on one plat receiving the heaviest application of nitrate of soda. The berries from this plat showed poor keeping quality. The season's work with insects is noted on page 752.

An attempt was made to control the horsetail weed by pouring a solution of copper sulphate in holes in the soil spaced 1 ft. apart each way. One qt. of a solution as strong as 1 lb. to 25 gal. of water was poured in each hole. The solution appeared to cause the horsetail to thrive instead of affecting it injuriously. Spraying with a 20 per cent iron sulphate solution was fairly effective in killing back the tops of the weeds although there appears to be a possible danger connected with the continued use of this chemical on the same area.

Experiments in resanding were continued. The results indicate that the yield of berries is reduced by a prolonged lack of resanding. In general the berries from unsanded plats kept better than those from sanded plats. Some notes are given on a test of spray mixtures in which it was demonstrated that resin fish-oil soap and arsenate of lead can not safely be used together as a spray unless lime is added. As a result of three years' experience there appears to be no distinct advantage in hand picking cranberries.

Observations on the station bog crop have shown that the higher and better drained portions usually produce more fruit than the low portions. An examination of the root systems of plants on high and low areas indicates that the root systems on flowed bogs are confined for the most part to sand above the peat, while on dry bogs the roots run well down into the peat. The author calls attention to the need of a more thorough knowledge of the underground portions of the cranberry plant.

Selection and preparation of land for cranberry culture, C. L. LEWIS (*Minnesota Sta. Bul. 142 (1914), pp. 9–46. figs. 18*).—This bulletin deals primarily with the problems involved in the selection of suitable land for cranberry culture, its preparation, planting, and care up to the fifth year. Brief general consideration is also given to the problems of harvesting, marketing, and protection from diseases and insects. A short bibliography is appended.

[Citrus experiments], S. E. COLLISON (*Florida Sta. Rpt. 1913, pp. XCVI, XCVII*).—In continuation of previous reports (E. S. R., 29, p. 237) measurements are given showing the average gain in diameter of trees from June, 1909, to June, 1913, growing on various fertilizer plats in the citrus experimental grove. So far the factors which stand out as evidently influencing growth are clean culture and excessive fertilization, the former in increasing and the latter in retarding growth. The clean culture plats continue to show the largest gains. The plat receiving no fertilizer continues to show less new growth, but no fertilizer or combination of fertilizers shows a predominating influence on growth.

Sand cultures of citrus seedlings, B. F. FLOYD (*Florida Sta. Rpt. 1913, pp. XLIV–LIII, figs. 2*).—This report embodies the result of a preliminary experiment carried out in the greenhouse to determine the effect of varying sources of ammonia and phosphoric acid upon the growth of grapefruit seedlings.

Measurements made during the first season indicate that a combination of dried blood and acid phosphate gave the best growth. The addition of lime to this mixture was a hindrance, the growth being only slightly better than that where lime was used without any fertilizer. A mixture of sulphate of ammonia and acid phosphate gave the poorest growth of any of the combinations. The addition of lime to this mixture improved the growth somewhat but lime used alone gave a much better growth. Nitrate of soda and nitrate of potash gave growth measurements which were much alike. Basic slag appears to be the better source of phosphoric acid for use with sulphate of ammonia and nitrate of potash, but was inferior to acid phosphate for use with dried blood.

Coconuts: Experiments at Peradeniya, M. K. BAMBER (*Dept. Agr. Ceylon Buls. 2 (1912), pp. 37–51; 10 (1914), pp. 135–146*).—The first of these bulletins is a progress report on fertilizer experiments with old coconut trees, started at the Peradeniya station in 1911. The second presents the results of three years' experimental work.

Palm fruits and seeds (*Missouri Bot. Gard. Bul., 2 (1914), No. 9, pp. 107, 108, pls. 2*).—This comprises illustrations of some 45 species of palm fruits and seeds received by the Missouri Botanical Garden from the Botanical Garden at Rio de Janeiro, Brazil.

The perpetual flowering carnation and how to grow it indoors and out-of-doors, E. J. WOOTTEN (*London, 1914, pp. 55, pls. 13*).—A popular treatise on the culture of carnations under glass and in the open, including also information relative to hybridization and raising from seed and diseases and their treatment. A monthly calendar of operations is also given.

Growing bulbs for winter and spring blooming, M. FULD (*New York, 1914, pp. 78*).—A popular treatise on bulb culture both indoors and in the open, including also a descriptive list of the more important ornamental bulbs.

The small rock garden, E. H. JENKINS (*London and New York, 1913, pp. XII+139, pl. 1, figs. 52*).—A popular treatise on the construction of rock gardens, including lists of plants suitable for all purposes and seasons, together with cultural details.

Gardens in the making, W. H. GODFREY (*London, 1914, pp. XVII+207, figs. 63*).—A popular treatise on garden design in which the important problems considered are the layout and general effect of the garden and the proper relationship of all parts of the garden to the whole. The text is accompanied by a number of garden plans.

FORESTRY.

The timbers of British Guiana, H. STONE and W. G. FREEMAN (*London, 1914, pp. XI+110, pl. 1*).—The present report contains a descriptive account of the wood of a large number of species of trees collected in British Guiana under the direction of A. G. Bell. Each wood is treated with reference to its nomenclature, salient features, physical characters, bark, uses, qualities, etc.

Studies on the periodicity of the life processes of trees native to continually humid tropical districts, S. V. SIMON (*Jahrb. Wiss. Bot. [Pringsheim], 54 (1914), No. 1, pp. 71–187*).—The author here reports observations and investigations on the life history of a large number of Javenese tree species. The literature of the subject is reviewed and a bibliography appended.

The genus Pinus, G. R. SHAW (*Pubs. Arnold Arboretum, No. 5 (1914), pp. 96, figs. 332*).—In part 1 of this work the author discusses the characters of the genus Pinus with special reference to their taxonomic significance and their utility for determining the limits of the species. In part 2 a classification of the species is given which is based on the gradual evolution of cone structure.

The relation of crown space to the volume of present and future stands of western yellow pine, G. A. BRIGHT (*Forestry Quart., 12 (1914), No. 3, pp. 330–340*).—A preliminary study of yellow pine stands with special reference to the relation between stand density and wood volume.

Volume table for lodgepole pine, A. T. UPSON (*Forestry Quart., 12 (1914), No. 3, pp. 319–329*).—The author here presents and discusses a volume table for lodgepole pine which was compiled from measurements secured on some 2,015 trees on the Arapaho Forest, Colorado.

Relative resistance of various conifers to injection with creosote, C. H. TEESDALE (*U. S. Dept. Agr. Bul. 101 (1914), pp. 43, pls. 8, figs. 9*).—The author here reports creosote penetration tests conducted with various species of conifers at the Forest Products Laboratory maintained by the Forest Service in cooperation with the University of Wisconsin. Introductory considerations have to do briefly with the gross and microscopic structure of coniferous woods and the experimental methods employed. The results of the tests are presented in a series of graphic curves and tables and fully discussed.

Turpentine possibilities on the Pacific coast, C. S. SMITH (*Proc. Soc. Amer. Foresters, 9 (1914), No. 3, pp. 327–338*).—The author here briefly summarizes

his investigations relative to the possibilities of various western species of pine for turpentine production.

Some experiments conducted in California show a yield of oleoresin from western yellow pine about 12 per cent greater than that obtained from southern yellow pine in average operations in Florida, the comparison being made on the same period of time for both sections. It is believed that the turpentine produced in California will be satisfactory for industrial purposes.

The low yield from western yellow pine in Oregon precludes its use for turpentine at the present time. Jeffrey pine in California yields somewhat less oleoresin than western yellow pine and the principal constituent, heptane (abietene), can not be used as turpentine. Heptane is used to a considerable extent in the manufacture of various medicinal products and it is believed a further market may be developed for it as an extractive in place of petroleum hydrocarbon fractions now used. The rosin from both of these pines is of high grade. Thus far the commercial exploitation of oleoresin from digger pine, single leaf piñon, lodgepole, and sugar pine is considered to be impractical.

The administration of a National Forest for naval stores, I. F. ELDREDGE (*Proc. Soc. Amer. Foresters, 9 (1914), No. 3, pp. 310–326*).—A descriptive account of the administration of the Florida National Forest with special reference to the conservative exploitation of naval stores.

Tenth annual report of the shade tree commission, G. B. ASTLEY, J. J. MOONEY, and F. L. DRIVER (*Ann. Rpt. Shade Tree Com., Newark, N. J., 10 (1913), pp. 79, pl. 1, figs. 32*).—A progress report on the work of the Newark Shade Tree Commission, including a map showing the streets planted and the species used since 1904.

Joint annual report of the forestry branches for the year 1912–13 (*Bd. Agr. and Fisheries [London], Joint Ann. Rpt. Forestry Branches, 1912–13, pp. 82, pl. 1, figs. 2*).—This comprises the first annual report of the forestry branches recently constituted in the Board of Agriculture and Fisheries and the Office of Woods.

The introductory chapter deals with the general attitude toward forestry and afforestation in England and Wales. The work of the forestry branches is then briefly reviewed. A historical note is given on the management of the crown forests and woods, together with notes on the individual woods and information relative to the school for working foresters and the wood distillation works on the Forest of Dean. The report concludes with a statistical review of the timber trade of the United Kingdom. Information relative to technical advice in forestry and the area of woodlands in England and Wales for 1913 is appended.

Report of the director of forests, N. W. JOLLY (*Ann. Rpt. Dir. Forests [Queensland], 1913, pp. 7, pls. 3*).—This is the report for the year ended December 31, 1913, relative to the administration and management of the state forests in Queensland, including data relative to forest areas, revenues, expenditures, etc.

Forestation a success in the sand hills of Nebraska, S. D. SMITH (*Proc. Soc. Amer. Foresters, 9 (1914), No. 3, pp. 388–395, pl. 1*).—A review of reforestation work in the sand hills on the Nebraska National Forest.

The sand dunes of Coos Bay, Oregon, H. D. HOUSE (*Plant World, 17 (1914), No. 8, pp. 238–243, figs. 2*).—In addition to a general descriptive account of the sand dunes information is given relative to the plants found growing on these dunes.

Study of protection finances and fire plans, J. F. PRESTON (*Proc. Soc. Amer. Foresters, 9 (1914), No. 3, pp. 342–355*).—The author here presents the results of study of various fire protection factors, conducted with special reference

to determining methods for estimating protection funds and the formation of fire plans.

Forest taxation in Washington, F. G. MILLER (*Proc. Soc. Amer. Foresters, 9 (1914), No. 3, pp. 407–447*).—The author here reports the results of inquiries among timber owners in the State of Washington to determine the actual burden of taxation on forest land as compared with that borne by other classes of real estate, the effect of the present system of taxation on the management of forest property, and what remedial legislation should be enacted.

DISEASES OF PLANTS.

Bacteria in relation to plant diseases, III, E. F. SMITH (*Carnegie Inst. Washington Pub. 27, vol. 3 (1914), pp. VIII+309, pls. 47, figs. 155*).—Continuing the method adopted in the previous volume (E. S. R., 27, p. 44), the author describes a number of vascular diseases of plants due to bacteria. Among these are the following: Bacterial disease of sugar cane (*Bacterium vasculorum*), sweet corn disease (*B. stewarti*), the Grand Rapids disease of tomato (*Aplanobacter michiganense*), bacterial disease of orchard grass (*A. rathayi*), Trinidad disease of banana (*Bacillus musæ*), and brown rot of solanaceous plants and wilt of tobacco (*Bacterium solanacearum*).

In addition to the above, notes and discussions are given of a number of diseases that have been attributed to bacteria, but which are considered too imperfectly known to be of definite classification or are of doubtful identity.

Phytopathological problems, J. ERIKSSON (*Inst. Internat. Agr. [Rome], Actes Conf. Internat. Phytopath., 1914, pp. 231–233*).—This is a brief discussion of certain plant diseases considered as falling in two categories, those long known and those of more recent appearance as dangerous pests, each in connection with measures looking to its control.

Means for combating plant diseases, M. HOLLRUNG (*Die Mittel zur Bekämpfung der Pflanzenkrankheiten. Berlin, 1914, 2. ed., rev. and enl., pp. VIII+340, figs. 30*).—This work is a revised and enlarged edition of the author's handbook of chemical means for combating plant diseases (E. S. R., 10, p. 363). Chemical, physical, and mechanical means for combating fungus and insect injuries are described at length, the author making a very comprehensive review of the literature during the first half of 1913 and that appearing previously regarding the use of fungicides and insecticides. A chapter is included on the construction and use of spraying apparatus.

Cryptogamic review for 1912, G. BRIOSI (*Atti Ist. Bot. Univ. Pavia, 2. ser., 15 (1912), pp. 242–273*).—This is a brief account of studies carried out during 1912 on cryptogamic diseases of plants, listing diseases and causative agencies according to plants attacked.

Maryland plant diseases, 1913, J. B. S. NORTON (*Rpt. Md. State Hort. Soc., 16 (1913), pp. 164–168*).—Notes are given on plant diseases observed in the State during the year, together with a brief discussion of the relation of weather to the prevalence of plant diseases.

Botany, H. S. HAMMOND (*New Mexico Sta. Rpt. 1913, pp. 34–36*).—The principal work of the plant pathologist is said to have been an investigation of the disease of chili peppers. The results indicate that the disease is of bacterial origin and that the organism is closely related to *Bacillus solanacearum*, which causes wilt of the tomato and other solanaceous plants. An experiment was carried on to test the value of treating seed for the prevention of the disease, but although various chemicals were used no benefit seemed to follow their application.

Notes are given on a number of other diseases, among them chlorosis of fruit trees, blight (*B. amylovorus*), cotton root rot (*Ozonium omnivorum*), bean rust (*Uromyces appendiculatus*), crown gall (*Pseudomonas tumefaciens*), potato blight (*Macrosporium solani*), and alfalfa leaf spot (*Pseudopeziza medicaginis*).

[Fungus diseases in Barbados], W. NOWELL (*Rpt. Dept. Agr. Barbados, 1912–13, pp. 44, 45; abs. in Agr. News [Barbados], 13 (1914), No. 314, p. 158*).—The author briefly reports on a number of diseases observed during the year.

Of the sugar cane diseases the root disease, caused by the fungus *Marasmius sacchari*, is said to have been the most important and injurious, while the rind disease (*Colletotrichum falcatum*) was rather unimportant. The author urges planters to exercise care in the selection of cane cuttings, using only the strongest and healthiest plants, in order that the injury due to the disease may be reduced as much as possible.

Attention is called to *Eutypa crumpens* on the evergreen *Ficus nitida* and other shade trees.

Brief notes are given on silver scurf on limes, which is considered probably due to *Coniothecium* sp. It is suggested that spraying with Bordeaux mixture might be useful in controlling it.

Brief notes are also given on the black spot of roses, rose mildew, and the powdery mildew of grapes, and suggestions are given for the control of these rather common diseases.

New fungus diseases of useful plants, E. PANTANELLI and U. CRISTOFOLETTI (*Staz. Sper. Agr. Ital., 46 (1913), No. 10, pp. 625–642, pls. 4*).—The authors report studies carried out by them on *Plcospora criobotryæ* n. sp. (conidial form, *Macrosporium criobotryæ* n. sp.), *Puccinia endiviæ*, *Psathyrella ampelina*, *Botryodiplodia chamæropis*, *Ascochyta pisi*, *Ovularia palmicola* n. sp., and *Macrosporium hesperidearum* n. sp., descriptions of the new forms being given.

New diseases and parasites noted and studied in the cryptogamic laboratory at Pavia, G. BRIOSI (*Atti R. Ist. Bot. Univ. Pavia, 2. ser., 16 (1914), pp. 72–75*).—The diseases here listed affect a great variety of plants, representing garden, field, forest, flower garden, etc.

Publications of the cryptogamic laboratory of Pavia, G. BRIOSI (*Atti R. Ist. Bot. Univ. Pavia, 2. ser., 16 (1914), pp. 75–102*).—The director gives lists, by years, of publications of the cryptogamic laboratory at Pavia from 1873 to 1912, inclusive.

A method of picking up single spores, C. W. EDGERTON (*Phytopathology, 4 (1914), No. 2, pp. 115–117, fig. 1*).—A description is given of a form of apparatus devised by the author, by which it is possible to secure single spores of any organism that is being studied.

The identity of the anthracnose of grasses in the United States, G. W. WILSON (*Phytopathology, 4 (1914), No. 2, pp. 106–112*).—The results of a study of all the available specimens of grass anthracnose are given, in which the author shows that the fungus causing this widespread disease has been described and specimens distributed under at least 14 different names. The data presented indicate that the proper name of the fungus should be *Colletotrichum graminicolum* n. n. In the course of his study he found this fungus present on species of 8 of the 12 tribes of the grass family.

Tylenchus dipsaci in the United States, E. A. BESSEY (*Phytopathology, 4 (1914), No. 2, p. 118*).—The author reports having found, in 1907, this nematode in rye grown at Edgerton, Kans.

Flag smut of wheat, G. P. DARNELL-SMITH (*Agr. Gaz. N. S. Wales, 25 (1914), No. 4, pp. 285–287, pl. 1*).—The best results obtained at the Cowra station from treating seed infected with *Urocystis tritici* followed dipping in 2 per cent

copper sulphate 5 minutes, then in lime water for 5 minutes. It is held that the lower infection rate resulting when the wheat is sown late in soil that has been moist for some time is usually due to the early germination and death of the spores. Pot experiments are claimed to show, however, that spores germinating in damp soil may produce germ tubes terminated by secondary spores, which may again produce elongated infection threads.

Head smut of sorghum and maize, A. A. POTTER (*U. S. Dept. Agr., Jour. Agr. Research, 2 (1914), No. 5, pp. 339–372, pls. 7, figs. 7*).—An account is given of the head smut of sorghum due to *Sorosporium reilianum*.

This fungus, it is said, was first reported from Egypt in 1868 and has been found to be a destructive parasite of sorghum, and to occur also on maize. The author has made a study of the organism grown in artificial cultures, and a detailed account of its life history is given. It is stated that the work of other investigators pointed to the conclusion that infection was by means of seed-borne spores, but numerous floral inoculations failed to show that it could be produced intraseminally and carried over in the seed to the next crop. On the other hand, large percentages of infection were repeatedly produced by the inoculation of seedlings with dry spore material. The author thinks that it is clearly proved that the parasite is not carried with the seed, but is wind-distributed in the locality in which it occurs, doubtless infecting the seedling from the soil.

But little appears to be known regarding the prevention of the head smut, but as milo maize is immune, this could probably be grown in regions where the other species of sorghum are subject to attack.

A bibliography is appended.

Some important contributions concerning the diseases of sugar beet plants in 1913, A. STIFT (*Bl. Zuckerrübenbau, 21 (1914), Nos. 5, pp. 72–75; 7, pp. 108–111*).—The author reviews some of the more important contributions pertaining to the diseases of sugar beets due to nematodes, fungi, etc.

Resistance in tobacco to hydrocyanic acid gas injury, J. JOHNSON (*Phytopathology, 4 (1914), No. 2, p. 118*).—Attention is called to the fact that fumigation with hydrocyanic acid resulted in the discoloration and wilting of the leaves of three varieties of tobacco, namely, Little Dutch, Cuban, and White Burley, while Connecticut Broadleaf remained free from injury in all parts of the greenhouse.

Report of assistant plant pathologist, O. F. BURGER (*Florida Sta. Rpt. 1913, pp. LXXXVII–XCV, figs. 3*).—The bacterial rot of lettuce, first reported some years ago at this station (E. S. R., 21, p. 342), was present to some extent, and an investigation was carried on to determine the effect of aphids in the distribution of the disease. Aphids were collected from an infected field and placed on two healthy lettuce plants, and in about 12 days the infected plants were reduced to a black putrid mass, seeming to indicate that the disease might be carried in this manner.

Notes are given on the lettuce drop, due to *Sclerotinia libertiana*, and a discussion is given of the relation of the fungus to atmospheric conditions and particularly that of temperature.

A brief account is given of the bacterial rot of cucumbers, which has been previously described (E. S. R., 30, p. 149), and notes on a number of vegetable diseases, among them those of tomatoes, beets, celery, onion, and cantaloup.

Fruit rot, leaf spot, and stem blight of the eggplant caused by Phomopsis vexans, L. L. HARTER (*U. S. Dept. Agr., Jour. Agr. Research, 2 (1914), No. 5, pp. 331–338, pls. 5, fig. 1*).—A report is given of a disease of eggplants that has been variously reported as due to *Phoma solani*, *Phyllosticta hortorum*, and *Ascochyta hortorum*. As a result of inoculation experiments and morphological

studies the author concludes that the above species are identical, but that the genus should be Phomopsis, and the name *P. vexans* n. comb., is given it.

Oxidases in healthy and in curly dwarf potatoes, H. H. BUNZEL (*U. S. Dept. Agr., Jour. Agr. Research, 2 (1914), No. 5, pp. 373–404, figs. 21*).—Summarizing his investigations on the oxidase in potatoes, the author states that the oxidase activity of the foliage of normally developed potato plants is greatest in the early stages of development. It falls off with the growth of the plants and rises again when the plant's growth about reaches a standstill. Curly dwarf potato plants show a greater oxidase activity than healthy ones of the same age, both in the juice of their tubers and in the juice of their foliage. The oxidative activity of the different parts of the potato plant has been established for 18 different reagents.

A brief bibliography is given.

A parasite of tomato (*Bol. Min. Agr., Indus. e Com. [Brazil], 2 (1913), No. 2, p. 165*).—A disease of tomato, noted in April, 1912, in northern Italy, is said to be that due to *Cladosporium fulvum violaceum* (E. S. R., 30, p. 749).

The plaster cast apple specimen, L. E. MELCHERS (*Phytopathology, 4 (1914), No. 2, pp. 113, 114, fig. 1*).—The author describes a method for the preparation of diseased materials of apple, pear, quince, and other fruits, in which, it is claimed, the characteristics of the disease are completely retained and the material kept readily available for permanent use.

Apple powdery mildew and its control in the Pajaro Valley, W. S. BALLARD and W. H. VOLCK (*U. S. Dept. Agr. Bul. 120 (1914), pp. 26, pls. 6, figs. 5*).—The authors describe the powdery mildew of apples, which is caused by *Podosphæra leucotricha* and *P. oxyacanthæ*.

In the Pajaro Valley, California, *P. leucotricha* is very common, attacking the foliage and current year's twig growth. It often makes such rapid progress during the spring and summer that by the end of the leaf-forming season it is said to be difficult to find normal, healthy leaves on certain unsprayed varieties. The fungus is described at some length and notes are given on the susceptibility of different varieties, after which accounts are given of spraying experiments for its control.

It is claimed that the apple powdery mildew may be controlled by foliage spraying with what the authors call iron-sulphid mixture (which consists of a solution of iron sulphate and lime-sulphur solution), precipitated sulphur, or sulphur in some other finely divided form. In addition winter pruning of the trees so as to obtain stimulating effects and removing mildewed twigs, together with winter spraying with some spray that has the effect of inducing vigorous foliage growth in the spring, should be employed.

The Jonathan spot rot, M. T. COOK and G. W. MARTIN (*Phytopathology, 4 (1914), No. 2, pp. 102–105*).—In a previous paper (E. S. R., 29, p. 847) the authors expressed the belief that the Jonathan spot rot was probably caused by species of Alternaria. Other investigators have claimed that it was a physiological trouble, due to gas, etc. The authors give a brief account of further investigations to determine, if possible, the cause of this trouble.

In 1913 a large number of apples were bagged during the growing season on the supposition that if the disease was due to an Alternaria, protection from infection would produce clean apples, while if it was due to physiological causes the apples would develop spots the same as those unprotected. The fruit matured and was examined in November and January.

It was found that the number of spots on the apples bagged previous to June 9 was much less than those bagged after that date. As a whole the bagged apples showed less spots than those which were not bagged. Two forms of spots were found, small nearly black Jonathan spots and rather large light

brown Alternaria spots. Many of the Jonathan spots were surrounded by a light brown area characteristic of Alternaria infections. Laboratory studies were made of these spots, and as high as 93 per cent of the large spots were found infected with Alternaria, while from the small spots a much lower percentage of the fungus was present, in one case as low as 30 per cent.

The authors believe that, having found two similar spots on the Jonathan, it is probable that different investigators may have been working with different spots. At present they do not consider the data sufficient for establishing any definite theory regarding the cause of this disease.

Fire blight, J. G. HALL (*Washington Sta. Popular Bul. 65 (1914), post card*).—A brief description is given of the fire blight of apples and pears, together with suggestions for treatment.

Brusone of pear, L. GABOTTO (*Agr. Mod. [Milan], 19 (1913), No. 23, p. 269, fig. 1*).—An illustrated description is given of injury done to the fruit, leaves, and branches of pear by *Fusicladium pirinum*, claimed to be the summer form of *Venturia pirina*.

Spraying with lime sulphur, A. MANARESI (*Agr. Mod. [Milan], 19 (1913), No. 23, pp. 271, 272*).—Experiments carried out on the control of *Exoascus deformans* and *Venturia* spp. during 1912 and 1913, employing several mixtures described, are said to confirm the high value of lime sulphur used in this connection.

A study of the brown rot fungus in the vicinity of Champaign and Urbana, Illinois, J. L. CONEL (*Phytopathology, 4 (1914), No. 2, pp. 93–101*).—On account of the differences of opinion regarding the specific identity of the fungus causing brown rot, the author carried on a series of experiments with material taken from plum mummies. The organism was isolated, cultivated in various media, and studied at length, after which inoculation experiments with plum, apple, crab apple, and cherry trees were made, the trees being infected with the organism.

From his experiments he concludes that the Sclerotinia occurring in that locality is *S. cinerea*. This fungus occurs predominantly on stone fruits, but as the result of inoculation tests he found that under laboratory conditions it may also infect pome fruits.

A brief bibliography is given.

The North American gooseberry mildew and its control, G. KÖCK (*Separate from Obstzüchter, No. 8 (1913), pp. 4, figs. 3*).—This is a brief account of the appearance, morphological development, and effects of *Sphærotheca mors uvæ* as noted in Europe, together with a discussion of means for its prevention and control, including severe cutting back in autumn, also a heavy application of lime sulphur at that time and in the spring just before development of the foliage, and a liberal application of sulphur to any parts showing the disease after the appearance of the foliage.

A new disease of gooseberry twigs, G. KÖCK (*Separate from Obstzüchter, No. 6 (1913), pp. 2, figs. 2*).—The author found diseased gooseberry twigs sent for examination to show abundant mycelium in the inner portions of the bark, which were speedily killed, showing abundant fructifications of a fungus which proved to be *Botrytis cinerea*.

Report of plant physiologist, B. F. FLOYD (*Florida Sta. Rpt. 1913, pp. XXVII–XLIV, figs. 2*).—This report consists principally of an account of investigations on the use of Bordeaux mixture for the control of die-back of orange trees and of the gumming of citrus trees produced by chemicals.

In the experiments with Bordeaux mixture trees were sprayed with a 5:5:50 mixture twice during the spring of 1912. In January, 1913, an examination was made of the grove and it appeared that Bordeaux mixture was effective for the

control of die-back, but that its benefits were somewhat hidden by a decrease of of the disease due to natural causes.

In the investigations on the gumming of citrus trees the author carried on experiments with a large number of chemicals inserted either in small holes bored into the trunk, or under the bark or placed on the forming buds. An enzym and 28 different organic and inorganic chemicals were used in the experiment, and of this number 13 induced the formation of gum. Most of these substances are classed as acids, alkalis, or salts of heavy metals. The production of gum was coincident with the injury caused by the chemicals. The most copious production of gum was caused by copper sulphate and the other salts of heavy metals, and the injury extended from the point of insertion in the bud or stock to the upper branches. The injury caused by the other compounds was confined to the region of insertion, and the amount of gum produced was relatively small. In all cases the gum was the same in character and appearance, being of a clear amber in color and completely soluble in water. A microscopical examination showed that in all cases the gum originated in the live embryonic xylem tissue outside the dead area produced by the chemical. Enlarged gum pockets were produced in the immature branches of the trees inoculated with copper sulphate and mercury bichlorid, and no differences in development, structure, or external appearance could be recognized between these and the pockets formed during the progress of the die-back disease. The author states that through the swelling of the gum collected in the gum cycle by the absorption of water, pressure is developed, and that if the covering tissue is inelastic a break will occur and the gum exudes. On the other hand, if the tissue is elastic, as in the immature branches, the covering tissue is raised and large gum pockets are formed in the stem.

Report of plant pathologist, H. E. Stevens (*Florida Sta. Rpt. 1913, pp. LXXII–LXXXVI*).—The investigations reported upon consisted mostly of a study of melanose, stem-end rot, gummosis, and fruit rot of citrus trees.

Melanose, caused by *Phomopsis citri*, which has been previously described (E. S. R., 28, p. 651), is briefly discussed and results of inoculation experiments are given which confirm previous conclusions regarding this disease and also show that it is due to a specific organism and does not result from any soluble toxin in dead twigs. Experiments were conducted to test the effect of fungicides for the control of melanose, lime sulphur, Bordeaux mixture, and ammoniacal copper carbonate solutions being sprayed upon orange trees in pots in the greenhouse. Lime sulphur seemed to prevent infection completely, but caused more or less injury to the foliage by burning. Bordeaux mixture and ammoniacal solution of copper carbonate gave about the same degree of control, and the injury to the foliage attributed to Bordeaux mixture was practically negligible, while there was some slight burning in one experiment with the ammoniacal solution of copper. An experiment with pruning on the effect of melanose has been begun, but sufficient time has not elapsed to give exact data regarding it.

Brief accounts are given of the stem-end rot, fruit rot, and scab.

The Fusariums from cankered cacao bark and Nectria cancri n. sp., A. A. L. Rutgers (*Ann. Jard. Bot. Buitenzorg, 2. ser., 12 (1913), pt. 1, pp. 59–63, pls. 4*).—A study was made of 15 apparent strains of Fusarium (six supposedly belonging to *F. colorans* and nine to *F. theobromæ*) on different substrata. Perithecia of one of the latter appeared to belong to the genus Nectria, but to coincide with no species yet listed. Accordingly this new species, which is here described, received the name *N. cancri*.

A trunk disease of the lilac, H. von Schrenk (*Ann. Missouri Bot. Gard., 1 (1914), No. 2, pp. 253–262, pls. 2*).—A destructive trunk disease noted during recent years in and around St. Louis, Mo., is described. It is said to be caused

by *Polyporus versicolor*, gaining entrance through holes made by borers. These may be killed by the insertion of a wire, after which the holes are to be given an antiseptic treatment and plugged. Diseased trunks are to be burned.

Endothia canker of chestnut, P. J. ANDERSON and W. H. RANKIN (*New York Cornell Sta. Bul. 347 (1914), pp. 551-618, pls. 5, figs. 25*).—The authors give the results of an extended investigation on the disease of chestnut due to *E. parasitica*.

After giving an account of the economic value of the chestnut, its soil requirements, and natural reproduction, the disease is described, its origin, spread, symptoms, and pathology being considered at length, and suggestions are given for its control. Under the last topic the authors state that there is nothing now known that will prevent the extermination of the American chestnut tree from this cause and that every measure of control that has been tried has been abandoned north of West Virginia and the Potomac River.

An extensive bibliography is appended.

Two trunk diseases of the mesquite, H. VON SCHRENK (*Ann. Missouri Bot. Gards., 1 (1914), No. 2, pp. 243–252, pls. 2*).—The author gives a description of the effects produced by *Polyporus texanus* on mesquite near San Antonio, Tex., with a description of the fungus. *Fomes rimosus* was also found in one instance on a mesquite in the same locality.

A bibliography is appended.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Bird houses and how to build them, N. DEARBORN (*U. S. Dept. Agr., Farmers' Bul. 609 (1914), pp. 19, figs. 48*).—This publication, prepared with a view to encouraging the protection and study of birds, gives plans for the construction of various forms of bird houses.

Physiological investigations of insect pests, J. DEWITZ (*Naturw. Ztschr. Forst u. Landw., 11 (1913), Nos. 3, pp. 129–143; 9, pp. 431–440*).—The first part of this paper has been noted from another source (E. S. R., 28, p. 752); the second part deals with the arrest of the growth of insect larvæ.

The compatibility of insecticides and fungicides, G. P. GRAY (*Better Fruit, 9 (1914), No. 2, pp. 9, 10, 35–42; Mo. Bul. Com. Hort. Cal., 3 (1914), No. 7, pp. 265–275*).—This discussion includes a classification of the various mixtures and gives a compatibility table.

Report of entomologist, J. R. WATSON (*Florida Sta. Rpt. 1913, pp. LIV–LXXI, figs. 4*).—The author first reports upon spraying experiments with Microcera in continuation of those previously noted (E. S. R., 29, p. 251), the general results of which were about the same as those tabulated in the previous report.

In a discussion of white fly conditions in various groves the author states that during the past two years in the groves under observation the fungi, especially the brown fungus, have done excellent execution, amounting in most cases to practical control so far as the summer brood is concerned and often the fall brood as well. The woolly white fly (*Aleyrodes howardi*) spread rapidly during the year, at the close of which it was found in groves as far east as Orlando. In some groves it is becoming so abundant as to be fully as serious a pest as *A. citri* and is much more resistant to parasitic fungi than either *A. citri* or *A. nubifera*. Two chalcidid species are said to parasitize it, one of which is quite common.

Observations of other citrus insects, including *Icerya purchasi*, *Leptothrips floridensis*, *Heliothrips hæmorrhoides*, *Pachnæus opalus*, and *Trirhabda brevicollis*, are briefly reported. Under the heading of destructive insects for the

year mention is made of injury to velvet beans by *Anticarsia gemmatilis;* the the attack of camphor buds by *Cryptothrips floridensis* (see E. S. R., 30, p. 357); defoliation of bay (*Persea* sp.) by *Trichostibas parvula;* etc.

Insect records.—Miscellaneous notes by officers of the division of entomology (*Agr. Jour. Union So. Africa, 8 (1914), No. 1, pp. 70–78, figs. 3*).—The several papers here presented include one on the gall on *Aloe transvaalensis*, caused by an Eriophyes mite, by B. B. Hardenberg (pp. 70–72); The False Codling Moth (*Enarmonia batrachopa*) with Particular Reference to Its Attack upon Acorns, by A. Kelly (pp. 72–75); An Interesting Larval Habit of the Pepper Tree Caterpillar (*Bombycomorpha bifascia*), by J. C. Faure (pp. 75, 76); etc.

Notes on the Hymenoptera Trichogrammatidæ and Mymaridæ, A. A. Girault (*Canad. Ent., 46 (1914), No. 9, pp. 327–330*).—Mention is made of *Anagrus armatus* as having been reared from egg clusters of *Delphax saccharivora* in sugar cane leaves, *Aphelinoidea semifuscipennis* from egg clusters of a leafhopper, and *Ufens niger* from leafhopper eggs in sugar cane, all at Rio Piedras, P. R. *Trichogramma minutum* is reported to have been reared from eggs of the sugar cane borer at Santa Lucrecia, Vera Cruz; Donna, Tex.; New Orleans, La.; Bridgetown, Barbados; Georgetown, British Guiana; in Trinidad; and in Porto Rico.

[Work with cranberry insects in 1913], H. J. Franklin (*Massachusetts Sta. Bul. 150 (1914), pp. 49–58*).—This is a more detailed report of the work than that previously noted (E. S. R., 31, p. 453).

The spanworm previously referred to has been determined as *Epelis truncataria faxonii.* In addition to the cranberry it has been found feeding on the bearberry (*Arctostaphylos uva-ursi*). The parasitic enemies of cranberry pests thus far identified are *Carcelia* (*Exorista*) *pyste, Phytodietus vulgaris,* and *Pimpla conquisitor,* which attack the dry bog fireworm (*Peronea minuta*); *Phanerotoma tibialis* and *Microbracon dorsator,* which attack the cranberry fruit worm; *Ichneumon extrematatis* and *Phorocera* (*Euphorocera*) *claripennis,* which attack the spanworm (*Cymatophora sulphurea*); *Winthemia quadripustulata,* which attacks the false army worm (*Calocampa nupera*); and *Exorista* (*Tachina*) *robusta,* which attacks the bud worm.

Cockroaches and ants as carriers of the vibrios of Asiatic cholera, M. A. Barber (*Philippine Jour. Sci., Sect. B, 9 (1914), No. 1, pp. 1–4*).—Experimental evidence of the transmission, vitality, retention of virulence, and longevity of the vibrio in the alimentary canal of the common cockroach (*Periplaneta americana*) is here presented. Feces containing cultures were exposed to starved roaches which devoured them greedily and the organisms were demonstrated in the feces from 6 to 79 hours after ingestion. "Cholera vibrios in cockroach feces will survive on human food at least 16 hours after discharge from the insect, and cholera vibrios in human feces will survive, in competition with numerous other bacteria, on food at least four days. There is no loss of virulence for guinea pigs in cholera vibrios after 29 hours in the intestine of the cockroach."

In experiments in which ordinary red ants (*Monomorium latinode*) were fed cholera cultures the organisms were recovered from their crushed bodies eight hours afterwards.

The coccobacillus of the locust, F. d'Herelle (*Ann. Inst. Pasteur, 28 (1914), Nos. 3, pp. 280–328, figs. 4; 4, pp. 387–407, fig. 1*).—The first part of this paper (pp. 280–296) consists of a somewhat detailed account of migratory locusts and their geographical distribution. The second part (pp. 296–301) gives a technical description of the coccobacillus (*Coccobacillus acridiorum*) affecting them. The third part (pp. 301–328) describes the work with the coccobacillus

in combating the locust. Part 4 (pp. 387–398) discusses the results which have been obtained in Argentina, Colombia, Cyprus, and Algeria. Part 5 (pp. 399–407) deals with the organization of the work.

The destruction of locusts in Algeria by Coccobacillus acridiorum, E. SERGENT and A. LHÉRITIER (*Ann. Inst. Pasteur, 28 (1914), No. 4, pp. 408–419, figs. 2*).—The authors report having succeeded in increasing the virulence of cultures of *C. acridiorum* for the Algerian locust (*Stauronotus maroccanus*) until the virus will cause death in about four hours. There appears to be some doubt as to whether the disease will spread sufficiently rapidly to produce results of practical value and further experiments will be carried on.

The oat aphis, J. J. DAVIS (*U. S. Dept. Agr. Bul. 112 (1914), pp. 16, figs. 9*).—The oat aphis (*Aphis avenæ*) is said to be the most widely distributed and most common over its area of distribution of the three important plant lice attacking wheat and oats above ground, and second only to the so-called green bug (*Toxoptera graminum*) in importance as a wheat pest. This aphidid was introduced into the United States previous to 1851 in which year it was recorded by Fitch. While it has never been considered a pest of great importance, observations would lead to the belief that it is worthy of more serious consideration.

It is found in all parts of Europe as well as in most of the States in this country and has been recorded from a large number of plants, particularly the grasses. The author presents a summary of its life history, habits, natural checks, remedial and preventive measures, etc., based upon the literature and experiments and observations by agents of the Bureau of Entomology of this Department.

The winter is passed in the egg stage on apple and related trees or as wingless females. In the spring the progeny from the eggs hatching on apple migrate to grasses and grains. From September to November the migrants return to the apple where several forms are produced and eggs laid; others remain on grasses or migrate to fresh grass hosts, passing the winter as viviparous females.

The species is freely attacked by various parasitic and predaceous enemies which doubtless are responsible for the usual control of this pest. As in the case with the spring grain aphis or green bug, it is practically impossible to control the oat aphis after it has once gained much headway in numbers and diffusion, but by proper precautions it is possible to prevent serious outbreaks.

Walnut aphids in California, W. M. DAVIDSON (*U. S. Dept. Agr. Bul. 100 (1914), pp. 48, pls. 4, figs. 18*).—This is a detailed report of studies of the life history and habits of aphidids commenced early in the year 1911 and continued until the summer of 1913, largely at Walnut Creek, Cal. The studies relate to the European walnut aphis (*Chromaphis juglandicola*) which alone infests walnuts of commercial value grown in California, and two native species found to be pests on native walnuts that are much used for stock on which to graft the European or Persian nut, namely, the American walnut aphis (*Monellia caryæ*) which attacks the eastern black walnut (*Juglans nigra*), and the little hickory aphis (*M. caryella*) which attacks the California black walnut (*J. californica*).

"In general the aphidids inhabit the underside of the leaves, but those of the second, third, and fourth generations often attack the nuts, sometimes seriously dwarfing them. . . . When infestation on the leaves and nuts is severe the vitality of the infested tree is impaired. The aphidids excrete a sweet, gummy, transparent substance much sought after by ants, and in this thrives a black sooty fungus. This blacks fungus often covers the upper sides of the lower leaves and the upper part of the nuts, thereby interfering with the

respiratory action of the plant tissues." Attacks on the tree from year to year also materially reduce its vitality.

The life history of the walnut aphidids in California in brief is summarized by the author as follows: "A week or so before the buds open on the trees in the spring the aphidids begin to hatch from the winter eggs. As soon as the young foliage appears the 'lice' settle on it, and after feeding for a month or so become adults. These stem mothers are always winged and like plant lice of later generations are capable of migrating to other trees and orchards. As soon as they are fully developed they produce young parthenogenetically. These second-generation young become mature in three weeks and in turn produce young. The individuals of the third and subsequent generations of summer mature in about 16 days. On early-leafing varieties there are 10 or 11 viviparous generations in the year while on late varieties there are 8 or 9. The production of the sexual generations is prolonged over four months, these forms first appearing in July. After the sexes (comprised of the winged male and the wingless female) mate, the female repairs to the twigs and limbs of the tree, there to deposit her eggs. Winter is passed in the egg stage only."

Of the many predatory enemies of the walnut plant lice the ashy-gray lady beetle (*Olla abdominalis*) is said to be the most important. As regards remedial measures the author finds that winter spraying directed against the eggs is the easiest to apply, and that high trees can be reached by a winter wash with ease. "Lime-sulphur and crude-oil emulsions are effective, especially the first named. The spray should be directed all over limbs and twigs so as to cover every part. If it is necessary to spray in spring or summer, a combination of 2 per cent distillate-oil emulsion and commercial tobacco extract No. 2 (1:1,500) will prove effective provided it be applied under a pressure of at least 150 lbs. and the spray directed on the nuts and underside of the leaves."

A bibliography of literature relating to these aphids is appended.

New or little-known species of Aphididæ, J. J. Davis (*Canad. Ent., 46 (1914), Nos. 2, pp. 41–51, figs. 13; 3, pp. 77–87, figs. 22; 4, pp. 121–134, figs. 19; 5, pp. 165–173, fig. 1; 7, pp. 226–236, figs. 12*).—Species here described as new include *Macrosiphum creelii* from alfalfa in Utah, Nevada, and Washington; *M. coryli*, which lives gregariously on the underside of the leaves and tender terminal shoots of hazel (*Corylus americana*), collected at La Fayette, Ind., and Chicago, Ill.; *M. venæfuscæ* from crested wild buckwheat (*Polygonum cristatum*) and curled leaf dock (*Rumex crispus*) in Indiana, from Rumex and *P. cristatum* in Wisconsin, and from Rumex in Missouri; *Symdobius albasiphus* from white oak in Illinois, Indiana, Missouri, and Virginia; and *Aphis pseudobrassicæ* from cabbage in New York, radish, turnips, kale, rape, and mustard in Indiana, and turnips in Texas.

Contribution to the study of the biology of the black aphis of the beet root, L. Gaumont (*Compt. Rend. Acad. Sci. [Paris], 157 (1913), No. 22, pp. 1092–1094; Rev. Phytopath. Appl., 1 (1914), No. 16–17, pp. 4, 5; abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 4, pp. 236, 237*).—*Aphis euonymi* causes considerable damage to beets in north and central France nearly every year. This aphidid passes the winter in the egg stage on Japanese spindle-trees, which are very numerous in parks and public gardens, as well as on the European spindle-tree (*Euonymus europæus*) and guelder-rose (*Viburnum opulus*).

The author observed at the end of October a field of beet roots in which the aphid was still present, both in parthenogenetic and sexual forms, and in which females were laying eggs at the bases of the leaves. Attention is called to the fact that the eggs which remain in the collar hatch in the cellar after the roots are stored and in the spring spread to Rumex, Chenopodium, and other wild plants.

Aphidid enemies of sorghum in the French Sudan, J. and A. VUILLET (*Agron. Colon., 1 (1914), Nos. 11, pp. 137–143; 12, pp. 161–165; 2 (1914), No. 13, pp. 17–23, figs. 8*).—This brief account deals with *Aphis sorghi*, *A. maidis*, and *Siphonophora leptadeniæ* n. sp., their natural enemies, and means of control.

Classification of the Aleyrodidæ, II, A. L. QUAINTANCE and A. C. BAKER (*U. S. Dept. Agr., Bur. Ent. Bul. 27, pt. 2, tech. ser. (1914), pp. 95–109, pls. 14*).—This second part of the work previously noted (E. S. R., 29, p. 54) completes the classification of the family. It deals with the genera of the subfamily Aleyrodinæ, of which 14 are erected as new, and lists the species belonging to each. The species *Aleurotithius timberlakei* n. g. and n. sp. from California is characterized.

A list of unplaced species of the old genus Aleyrodes is appended.

The life history of Psylla isitis (Psyllopa punctipennis, Crawford), the "psylla" disease of indigo, A. J. GROVE and C. C. GHOSH (*Mem. Dept. Agr. India, Ent. Ser., 4 (1914), No. 6, pp. 329–357, pls. 6*).—The author presents the details of studies of *P. isitis* made during the course of investigations of enemies of indigo in Behar.

A general account of this pest and its relation to other diseases of indigo by Maxwell-Lefroy has been previously noted (E. S. R., 29, p. 854).

The lesser bud moth, E. W. SCOTT and J. H. PAINE (*U. S. Dept. Agr. Bul. 113 (1914), pp. 16, pls. 2, fig. 1*).—This bulletin presents the results of studies of the life history and habits and means of control of *Recurvaria nanella* which were carried on during 1913 at Benton Harbor, Mich. A preliminary account of this pest by the authors has been previously noted (E. S. R., 31, p. 252).

This insect has attained quite wide distribution throughout the Northeastern and North Central States, having been collected in New Hampshire, New York, Pennsylvania, Ohio, Maryland, and the District of Columbia. Its food plants include apple, pear, peach, plum, cherry, wild plum, and hawthorn.

In rearing cages at Benton Harbor the first moths issued on June 22, the maximum emergence taking place on June 30 and the last moths appearing on July 10. Eggs were loosely deposited among the hairs on the underside of apple leaves, singly or several sticking together, for the most part along the veins; others were deposited on a twig under the edge of a small scale. They commenced hatching about July 15. The larvæ at once commence boring through the epidermis of the leaf on the underside and the construction of a mine in the inner tissues. On arrival of the first cold days of fall they begin leaving the mines to construct small silken hibernacula in which they pass the winter on the trees. After a few warm days in the spring they commence to appear in great numbers. At Benton Harbor the first larvæ were observed working in the buds in considerable numbers on April 15, at which time the buds were just beginning to swell. By April 23 all had apparently entered buds. On boring into a bud the larva makes its way directly to the center, there feeding on the tender ovary, stamens, and pistils of the unopened flower, provided the insect has entered the flower bud, as the majority do. After consuming the inner portions the larva feeds upon the leafy tissue of the bud, remaining within until the bud expands and the leaves begin to unfold. As the first leaves open out, it fastens them together by spinning a silken thread about them and constructs a shelter for itself, often rolling over the edge of a leaf and constructing it from within, or bringing the tips of several leaves together. It then greatly deforms and hinders the succeeding leaves as they develop.

On May 15 the caterpillars were observed to have left some of the nests in the leaves and to be constructing cocoons beneath loose bits of bark on the limbs and trunk in which to pupate. The larval stage was found to cover an average period of 10 months, the last crawling larva in the orchard having been found on June 19. The first pupa was observed on May 18 and the last larva pupating in rearing cages did so on June 16. The average time spent in the pupal stage was about 15 days, varying, however, from 15 to 30 days.

Hymenopterous parasites representing six families and seven genera were reared from material collected in the larval and pupal stages and confined in breeding cages. Experiments carried on and observations made throughout the infested section at Benton Harbor show that this pest can be controlled by thoroughly spraying the trees with lime-sulphur at 32° Baumé, used at the rate of 1 gal. to 8 gals. of water just before the buds swell or preferably when the buds are swelling.

A list of the more important literature cited is appended.

The insensitivity of the life forms of the potato moth to various poisons, F. Stoward (*Reprint from Rpt. Austral. Assoc. Adv. Sci., 14 (1913), pp. 326–329; abs. in Rev. Appl. Ent., 1 (1913), Ser. A, No. 10, p. 377*).—*Phthorimæa operculella*, which defoliates the potato plant and infests the tubers, is one of the most troublesome enemies of this crop in Australia. The most satisfactory manner of dealing with this pest is said to have been through fumigation with carbon bisulphid. In experimental work the larva, whether in the tuber or exposed, succumbs after 15 or 16 hours' exposure to an atmosphere containing carbon bisulphid in the proportion of 1 to 2 lbs. per 1,000 cu. ft. of air. Forty-eight hours are required to destroy the pupa and a single application under these conditions does not invariably suffice. In the majority of the experiments the eggs succumb to a single fumigation of 48 hours' duration but a second fumigation should follow from 6 to 8 days after the first.

Investigation has shown that commercially sound unsprouted tubers may be subjected to an intermittent fumigation with carbon bisulphid at the strength above mentioned, two, three, or even four times without producing serious damage to the tuber buds if each fumigation is limited to a period of 48 hours' duration.

An outbreak of the Forleule (Panolis griseovariegata) in northern Bohemia in 1913, W. Sedlaczek (*Mitt. Forstl. Versuchsw. Österr., No. 38 (1914), pp. 65–75*).—*P. griseovariegata* was a source of considerable injury in 1913 to forests in the vicinity of Weisswasser where from 1907 to 1910 the nun moth had caused great damage.

How war has been waged in Mexico against the mosquito, E. Liceaga (*Amer. Jour. Trop. Diseases and Prev. Med., 2 (1914), No. 2, pp. 118–123*).—A paper presented before the American Society of Tropical Medicine, held at Boston in May, 1914.

What the farmer can do to prevent malaria, R. H. von Ezdorf (*Pub. Health Rpts. [U. S.], Sup. 11 (1914), pp. 6*).—This paper calls attention to the importance of screening and use of mosquito bars, destruction of breeding places of mosquitoes, use of quinin as a prophylactic measure, etc.

Breeding and colonizing the syrphid, P. L. Guppy (*Dept. Agr. Trinidad and Tobago Bul., 13 (1914), No. 82, pp. 217–226, pls. 2*).—This paper presents information which supplements that previously noted (E. S. R., 30, p. 457), and reports the results of investigations which show how this predator can be bred and colonized. A pairing cage 6 by 6 by 6 ft. was used, also lamp chimneys 9 by 4 in. in which to place the females to lay after having paired.

A review of the work on the poisoned bait spray, dry method, and mixed treatment of controlling fruit flies (Trypetidæ), H. H. P. Severin (*Canad.*

Ent., 46 (1914), Nos. 7, pp. 243–246; 8, pp. 277–284, figs. 3; 9, pp. 309–314).—A review is given of the methods employed and the results obtained, taken up under the headings of the Mediterranean fruit fly (*Ceratitis capitata*), melon fly or bitter gourd fruit fly (*Dacus cucurbitæ*), olive fly (*D. oleæ*), Mexican fruit fly (*Anastrepha ludens*), apple maggot, cherry fruit flies (*Rhagoletis cingulata* and *R. fausta*), currant fruit fly, and imported onion fly (*Pegomya cepetorum*). The work by Italian entomologists has been left for a later paper. References are given to the literature reviewed.

Report of investigation of the fruit fly situation in the Territory of Hawaii. F. MASKEW (*Mo. Bul. Com. Hort. Cal., 3 (1914), No. 6, pp. 227–238*).—"The clean culture campaign has not controlled the Mediterranean fruit fly even in the policed district, nor has it reduced the amount of infested material recorded as reaching the mainland. The value or not of the clean culture campaign is purely a local problem, and the desirability of a continuance, also provision for its maintenance, is in my opinion a matter for the local authorities to decide. The melon fly (*Dacus cucurbitæ*) is the source of great financial loss to the producers, and all of its hosts should be included in the list of material covered by the United States quarantine order.

"The horticultural interests of the mainland would be far better protected by a federal supervision of horticultural exports similar to the system in force in the gipsy moth area, than by continuing the clean up of house yards in Honolulu and its environs. Every article of commerce between the islands and the mainland, including vessels and persons, constitute a potential danger of introducing the fruit fly at all times, and the commercial shipments of bananas under the present system of federal inspection do not constitute a greater danger of infestation than other articles of general commerce. The question of mail, sealed baggage, and passengers' clothing as avenues of entrance open at present to various hosts of the Mediterranean fruit fly is one of grave importance, and measures looking to the complete control of the same should be devised in such a manner as will withstand any attempt to defeat their legality, and authority given to the horticultural quarantine officers for their prompt enforcement."

Narcissus flies (*Jour. Bd. Agr. [London], 21 (1914), No. 2, pp. 136–141, pl. 1; Bd. Agr. and Fisheries [London] Leaflet 286 (1914), pp. 7, figs. 9*).—This is a general account of *Merodon equestris* and *Eumerus strigatus*. See also a previous note (E. S. R., 30, p. 458).

The dusty surface beetle (Opatrum æquale), R. W. JACK (*Rhodesia Agr. Jour., 11 (1914), No. 6, pp. 894–901, pls. 2, fig. 1*).—This beetle is a source of injury through its habit of devouring maize seed when planted in dry soil.

In the present paper the author presents the results of field and laboratory studies of the pest which have extended over a period of two years. The experiments have shown the poison-bait method to be effective in dealing with this beetle.

Hymenopterous parasites of Aphis euonymi, A. MALAQUIN and A. MOITIÉ (*Compt. Rend. Soc. Biol. [Paris], 76 (1914), No. 16, pp. 803–805*).—The authors have found no less than 17 different species of Hymenoptera to parasitize the black beet aphis of which *Trioxys auctus* and *Aphidius crepidis* are the most abundant. Preliminary studies of the biology of these two species and their utilization are reported.

Some notes on parasitism of chrysopids in South Carolina, E. A. MCGREGOR (*Canad. Ent., 46 (1914), No. 9, pp. 306–308, fig. 1*).—Of 99 chrysopid cocoons collected and observed daily 48 yielded parasites and 51 chrysopids. The parasites reared, in order of relative abundance, are *Chrysophagus compressicornis*, *Perilampus* sp., *Goniocerus* sp., *Isodromus iceryæ*, *Orthizema atriceps*, and

Helorus sp. *C. compressicornis*, in addition to having been reared frequently from chrysopids, was reared on one occasion from an undetermined syrphid pupa. *Pachyneuron allographæ* and *Syrphophagus mesographæ* were also reared from the same syrphid species.

The economic importance of wood lice, W. E. COLLINGE (*Jour. Bd. Agr. [London], 21 (1914), No. 3, pp. 206–212, pl. 1*).—Of 35 species found in the British Isles not more than nine or ten are sufficiently common to be of economic importance. The commonest and most numerous of these species, which are here discussed, are *Trichoniscus roseus*, *Oniscus asellus*, *Porcellio scaber*, *P. pictus*, *P. lævis*, *Porcellionides pruinosus*, and *Armadillidium vulgare*.

The rust mite and its control, W. W. YOTHERS (*Proc. Fla. State Hort. Soc., 27 (1914), pp. 115–119*).—A brief account is first given of the life history of this mite, which is known to occur in California, Hawaii, Mexico, Jamaica, Cuba, and Australia, as well as Florida. It is said to have been recorded also from Philadelphia and New York, where it undoubtedly infested citrus trees growing in greenhouses. While citrus fruits and trees are given in the literature as the only food plants, the author reports having found a mite on roses which resembles the rust mite of the orange.

The author's investigations lead him to conclude that a reduction in the size of oranges close to 25 per cent of the total crop is caused by this mite. He states that a sulphur soda solution consisting of sulphur 30 lbs., caustic soda (98 per cent) 20 lbs., and water 20 gal. applied at the rate of 1:60 or 1:66 will kill the mites and that a dilution of 1:40 will destroy the egg.

The data relating to lime-sulphur have been noted from another source (E. S. R., 31, p. 549).

A mixture consisting of 1 lb. flowers of sulphur and 2 lbs. of hydrated lime applied frequently with a dusting machine is also reported to have given satisfactory results.

New observations on the biology of Fasciola hepatica, D. SSINITZIN (*Centbl. Bakt. [etc.], 1. Abt., Orig., 74 (1914), No. 3–4, pp. 280–285, figs. 3*).—The author reports that he was unable to find young distomes in the liver of rabbits during the first four days following infection but that they were always found in the abdominal cavity.

FOODS—HUMAN NUTRITION.

Studies on chicken fat.—VI. The factors influencing the acid value of the crude fat, MARY E. PENNINGTON, J. S. HEPBURN, and E. L. CONNOLLY (*Proc. Amer. Soc. Biol. Chem., 3 (1913), No. 1, p. 38*).—A summary of a paper presented at the eighth annual meeting of the American Society of Biological Chemists at Philadelphia, Pa., December, 1913, and continuing previous work (E. S. R., 28, p. 63).

According to the authors, "low temperatures tend to retard the hydrolysis of the fat. The acidity is influenced to some extent by the quantity of fat, expressed as percentage of the body weight; other conditions being equal, a large quantity of fat is usually accompanied by a low acid value and vice versa. The acidity is also dependent on the degree of activity of the lipase. The degree of saturation of the fatty acids, measured by the iodin number, and the titer of the insoluble fatty acids, apparently, are without influence on the acidity.

"The study reported would tend to confirm the reliability of the acidity of crude chicken fat as an index of decomposition. The influence exerted by the various factors, just enumerated, while of interest from the viewpoint of acquiring knowledge of biochemical processes and especially of those relating to

the decomposition of fat, does not vitiate the practical usage of this method as it has been applied [in the authors'] laboratory."

The relation between spoiling and the age of hen's eggs. H. KÜHL (*Hyg. Rundschau, 24 (1914), No. 5, pp. 253–259*).—From an examination of a large number of sorts of commercial eggs, the author concludes that the following would be a good classification for trade purposes: Fresh eggs, those from 8 to 10 days old; eggs, those not over 4 weeks old; and cooking eggs, any offered for sale which are not spoiled.

The occurrence of fumeric acid in fresh beef. H. EINBECK (*Hoppe-Seyler's Ztschr. Physiol. Chem., 90 (1914), No. 3, pp. 301–308*).—The experimental data reported led the author to conclude that fumeric acid is a constituent of the extract of fresh beef and furnished additional evidence of the occurrence of succinic acid.

Bacteriological findings in Baltimore oysters. M. JOSEPH (*Bul. Johns Hopkins Hosp., 25 (1914), No. 278, pp. 128–131*).—This study was undertaken to ascertain whether the oysters sold in Baltimore contained organisms derived from the human intestinal tract and whether or not their bacterial content varied with the season of the year. The results of the examination indicate the quality of the oysters at the time they were sold and not when collected. The methods of examination were those adopted by the committee of the American Public Health Association on standard methods of shellfish examinations. The method of procedure is fully described and the results are presented in tabular form.

The results indicated that the oysters sold in Baltimore are as a rule free from sewage contamination. It was found that in the early fall and in the spring the bacteriological content of the oysters was high, while in the cold winter months the bacterial content was low.

Fish sausage as a general article of diet. L. BITTER (*Umschau, 18 (1914), No. 18, pp. 365–367*).—The author summarizes data and states that fish sausage is a palatable, nutritious, and economical foodstuff. See also a previous note (E. S. R., 25, p. 163).

The chemical effects of polarized light. E. G. BRYANT (*Chem. News, 108 (1913), No. 2811, pp. 177, 178; abs. in Chem. Abs., 8 (1914), No. 9, p. 1626*).—The author discusses the widespread belief as to the harmful effects of moonlight upon fish and meat intended for food. Moonlight, it is pointed out, is more or less polarized, and investigations showed that slices of fish exposed to strong polarized light decomposed much sooner than those exposed to direct light from the same source.

Report on chemical composition of wheat. G. A. OLSON (*Washington Sta. Popular Bul. 68 (1914), pp. 4*).—A popular review and summary of some of the material published in Bulletin 111 of the station, previously noted (E. S. R., 29, p. 833).

Milling of wheat and testing of flour. H. MCCORMACK (*Jour. Indus. and Engin. Chem., 6 (1914), No. 5, pp. 423–428*).—Data are summarized and discussed in this address, delivered in Rochester, September, 1913.

Edible and nonedible mushrooms. BERTRAND and A. SARTORY (*Bul. Soc. Sci. Nancy, 3. ser., 14 (1913), No. 2, pp. 82–92*).—Extended data are given regarding the numerous varieties of mushrooms found in the vicinity of Nancy, France, with reference to their nature, domestic use, and the toxic properties of some varieties together with their antidotes.

"Zipangu," a new coffee compound containing ivory nuts, and its evaluation. J. GORBING (*Ztschr. Öffentl. Chem., 19 (1913), No. 14, pp. 266–277; Chem. Zentbl., 1913, II, No. 10, pp. 893, 894*).—An analysis is reported.

Food and drug examinations, C. D. HOWARD (*Quart. Bul. Bd. Health N. H., 3 (1914), No. 2, pp. 47–58*).—Data are given regarding the examination of a large number of samples of drugs and food materials, including among others baking powders and egg substitutes, coffee and cocoa, and breakfast cereals.

[Food inspection and analyses] (*Penn. Dept. Agr., Mo. Bul. Dairy and Food Div., 11 (1913), No. 2–3, pp. 41–117*).—General and analytical data are given regarding the inspection and analysis of a large number of samples of milk and dairy products and proprietary foods.

Results of slaughterhouse and meat inspection in the German Empire for the year 1911 (*Die Ergebnisse der Schlachtvieh und Fleischbeschau im Deutschen Reiche im Jahre 1911. Bearbeitet im Kaiserlichen Gesundheitsamte. Berlin, 1913, pp. IV+139*).—This report, which was prepared by the Imperial Bureau of Health, consists chiefly of statistical data.

Ceylon's food supply, C. K. MOSER (*Daily Cons. and Trade Rpts. [U. S.], 17 (1914), No. 114, pp. 891–893*).—A brief summary of data regarding the kind and quantities of food used in Ceylon.

The dietary of the civilian employees at the cartridge factory of Vincennes, A. DEJOUANY (*Bul. Soc. Sci. Hyg. Aliment., 4 (1914), No. 3, pp. 103–121*).—A study of family budgets is reported, which contains tabulated data regarding the amounts of food eaten, income, expenditures, and ratio of income to expenditures.

The author concludes that the diet supplies sufficient amounts of fat, carbohydrates, and energy, and that in some instances the amount of these substances is more than is necessary. It is pointed out that some money is wasted in the purchase of too much meat and wine, by purchasing the more expensive cuts of meat, by buying food already cooked from restaurants and delicatessen stores, etc. A plea is made for instruction in home economics.

Menus for children (*Boston Cooking-School Mag., 18 (1914), No. 10, pp. 790, 791*).—Menus are suggested for children in an institution having a "home table."

Foodstuff—a digest (*Schenectady, N. Y., 1914, pp. 32*).—Nutrition and the composition of common foods are considered in this summary and there is a special section on sandwiches of different sorts. The publication is designed for extension work among wage-earners through mothers' clubs.

Scientific suggestions regarding home management, R. LEBLANC (*Notions scientifiques d'Enseignement ménager. Paris, 1913, pp. 324, pls. 3, figs. 115*).—Food, clothing, shelter, and household management are considered in this handbook.

Creatin- and creatinin-free foods, RITA K. CHESNUT (*Proc. Amer. Soc. Biol. Chem., 3 (1913), No. 1, p. 35*).—A summary of a paper presented at the eighth annual meeting of the American Society of Biological Chemists at Philadelphia, Pa., December, 1913.

According to the results of the author's analytical studies "creatin and creatinin [are] absent in crabs, lobster, shrimps, clams, oysters, scallops, caviar, calves' brains, sweetbreads, and milk. In bloater paste total creatinin is 0.12 per cent, in anchovy paste 0.085 per cent, in whitefish 0.19, and in halibut 0.36 per cent."

Further studies in the comparative biochemistry of purin metabolism, A. HUNTER and M. H. GIVENS (*Proc. Amer. Soc. Biol. Chem., 3 (1913), No. 1, pp. 17–19*).—In a paper presented at the eighth annual meeting of the American Society of Biological Chemists at Philadelphia, Pa., in December, 1913, the authors' experiments are briefly summarized together with the results of some other investigators. Though some of the results are only preliminary, the

authors are of the opinion that the following conclusions may be safely drawn:

"In all species except man and the higher apes . . . allantoin is quantitatively by far the most important product of purin metabolism. In carnivora and rodents 'uricolysis' is always practically complete; in the monkey it is slightly, in the opossum decidedly, less so; among ungulates there is no definite rule. While in the majority of species uric acid is excreted in greater abundance than purin bases, there are instances, especially frequent among the ungulates, where the reverse is true; the precise relation between the two is, even for the species, not so constant as the uricolytic index. The total endogenous purin metabolism per unit of weight is in a general way inversely related to the size of the animal; but there are notable exceptions."

The specific rôle of foods in relation to the composition of the urine, N. R. BLATHERWICK (*Proc. Amer. Soc. Biol. Chem., 3 (1913), No. 1, pp. 34, 35*).—A summary of a paper presented at the eighth annual meeting of the American Society of Biological Chemists at Philadelphia, Pa., in December, 1913. Experiments were made with healthy men on a uniform diet, to which single foods were added during the experimental period after normal values had been established.

According to the author, the results showed that "some vegetables and fruits, because of their content of bases, are markedly efficient in reducing $\overset{+}{(H)}$ and ammonia excretion. They also produce conditions which enable the urines to dissolve uric acid. Potatoes, oranges, bananas, apples, raisins, cantaloups, and tomatoes caused such effects. The presence of certain organic acids in fruits leads to an increased acid production due to their incombustibility in the body. Cranberries, plums, and prunes are examples. Benzoic acid, which is found in them, was also shown to produce like results. All urines of $\overset{+}{(H)}$ less than 7.00 were capable of dissolving uric acid when opportunity offered. When the $\overset{+}{(H)}$ was greater than 1×10^{-7}, uric acid precipitated, i. e., the urines were supersaturated. The average $\overset{+}{(H)}$ of 30 vegetarian urines was found to be 6.63 as compared with the higher value of 6.03 obtained for normal urines by Henderson and Palmer."

Concerning the theory of the constancy of uric acid excretion in individuals, O. FAUSTKA (*Pflüger's Arch. Physiol., 155 (1914), No. 10–12, pp. 523–546, fig. 1*).—From his investigations the author concludes that in the case of adults the excretion of uric acid is a physiological constant under like conditions.

Studies on enzym action.—X, The lipolytic properties of human duodenal contents, K. G. FALK (*Jour. Amer. Chem. Soc., 36 (1914), No. 5, pp. 1047–1057*).—In a number of cases, under varying conditions, the lipolytic activity of human doudenal contents was tested.

Two lipases were found to be present. "One of these, found as a rule after ingestion of food, was, under certain definite experimental conditions, more active toward triacetin than toward ethyl butyrate; the other, present when no food had been taken, was more active toward ethyl butyrate than toward triacetin. The importance of these two lipases in diagnostic work was pointed out. . . .

"The effect of a number of neutral salts and alcohols in different concentrations on the activity of the duodenal contents on the two esters was studied."

Concerning lipoid-free diet and its relation to beri-beri and scurvy, W. STEPP (*Deut. Med. Wchnschr., 40 (1914), No. 18, pp. 892–895*).—A summary and

digest of data which led to some general conclusions and the suggestion that both vitamin and certain definite lipoids are necessary for life.

On the protective and curative properties of certain foodstuffs against polyneuritis induced in birds by a diet of polished rice, II, E. A. COOPER (*Jour. Hyg. [Cambridge], 14 (1914), No. 1, pp. 12–22*).—Continuing previous work (E. S. R., 28, p. 760), experiments are reported with pigeons in which the protective power of various substances was studied to prevent polyneuritis following a diet of polished rice. The author's general conclusions follow.

"Nuts (husked filberts) are very efficient in preventing polyneuritis, being even superior to lentils and husked barley. Cheddar cheese, on the other hand, even in considerable amount, has no preventive effect.

"Malt extract taken from two different samples readily cured polyneuritis in pigeons. A third sample, however, even in large doses had no curative action.

"For the prevention of beri-beri, egg yolk, heart muscle, liver, nuts, barley, and lentils can be recommended as suitable foodstuffs with which to supplement the polished rice diet. As meat (voluntary muscle) has been frequently found to be ineffective in preventing epidemics of beri-beri, its replacement by heart and liver in mixed diets would be a considerable improvement, because not only are these tissues when suitably prepared as nutritious as voluntary muscle but they also contain the antineuritic substances in much higher concentration."

Phosphates and wheat bran in animal nutrition, P. CARLES (*Répert. Pharm. et Jour. Chim. Méd., 3. ser., 25 (1913), No. 3, pp. 97–99*).—The relative values of mineral phosphates, animal phosphates such as dried and powdered bones, and wheat bran are discussed.

The author regards mineral phosphates as worthless, while animal phosphates show a marked beneficial effect upon animals. Wheat bran is superior to animal phosphates, because of its stability and good keeping quality.

Data are given regarding the amount of phosphates present in the materials which the author discusses.

Behavior and effect of sugars of different sorts in the body, P. ALBERTONI (*Ergeb. Physiol., 14 (1914), pp. 431–473*).—An exhaustive digest of experimental data.

The effect of sugars on the secretions, D. LO MONACO (*Arch. Farmacol. Sper. e Sci. Aff., 17 (1914), Nos. 3, pp. 127–144; 4, pp. 145–177*).—This is a progress report of experiments in which are being studied the effects of sugars upon the salivary, intestinal, and renal secretions. The sugars were taken into the body in part via the stomach and in some cases by means of intravenal or subcutaneous injections. A digest of the work done by others along this line is given. Extended data of the experiments are presented, but no general conclusions are drawn, as further work is to be reported on the subject.

The comparative value of various sugars in the feeding of infants, C. C. HASKELL (*Arch. Ped., 30 (1913), No. 8, pp. 572–587; Lilly Sci. Bul., 1. ser., No. 4 (1914), pp. 136–150*).—The data obtained in tests with infants, either convalescent or suffering with more or less chronic conditions, indicate, according to the author, that the best results were obtained with a diet containing "malt-soup extract," with lactose and a mixture of dextrins with maltose following in the order named. He points out that the conclusions have nothing to do with the selection of sugar for normal infants, and states that he has "seen nothing in the literature to prove nor have we made any observations in support of the contention that the maltose-dextrin mixtures are in any way superior to lactose for addition to the food of the average sound infant."

Industrial maltose, C. B. DURYEA (*Jour. Indus. and Engin. Chem., 6 (1914), No. 5, pp. 419–423*).—In this general discussion of data the author summarizes

the results of some experiments in candy making, by himself and others, which he believes indicate that such products stand cooking heats "as well or better than the best glucoses" and have other good properties. As a whole the article is a polemic comparison of glucose and maltose.

The effect of glucose on autolysis—a possible explanation of the protein-sparing action of carbohydrates, P. A. SHAFFER (*Proc. Amer. Soc. Biol. Chem., 3 (1913), No. 1, pp. 36, 37*).—A summary of a paper presented at the eighth annual meeting of the American Society of Biological Chemists at Philadelphia, Pa., in December, 1913.

The results of a series of antiseptic autolysis experiments (made with hashed dog liver) seem to indicate that the addition of 1 per cent of glucose under some conditions slightly inhibits the action of proteolytic enzyms. The author believes this may be a confirmation of the hypothesis that "the 'protein-sparing action of carbohydrates' is exerted through the influence of the concentration of glucose or of glycogen upon the enzyms of the cells.

"The explanation of the 'sparing action' on the supposition that sugar when present is merely burned by preference and thereby makes unnecessary the catabolism of (body) protein, is wholly inadequate. Food protein is not thus spared . . . It seems to the writer that instead of supposing with Landergren that body protein (in carbohydrate starvation) is catabolized to supply the essential sugar, it is more likely that so long as a normal concentration of sugar (or glycogen) is present in the cell the proteolytic enzyms are somewhat held in check and the strictly endogenous catabolism is restricted to its normal low value, but that when carbohydrate food is lacking and the sugar (or glycogen) concentration in the cells falls, an inhibition is removed, the proteolytic enzyms become correspondingly more active, a larger amount of cell protein is digested, and the products like the products from food protein are in part converted into glucose.

"It is believed that the autolysis experiments support this point of view."

Origin of glycogen—rôle of proteins and fats, N. C. PAULESCO (*Compt. Rend. Soc. Biol. [Paris], 76 (1914), No. 1, pp. 50–52*).—From the results of experiments here reported it is concluded that albuminoid substances like fibrin, meat, or gelatin are important sources of glycogen, peptones are to be regarded as only mediocre sources, albuminoid substances like casein, egg white, and egg yolk are of little importance, and fats such as butter, lard, and beef fat, and olive, cottonseed, and linseed oils are not sources of glycogen.

Concerning pentosans as a source of energy in the animal body, P. SCHIROKICH (*Biochem. Ztschr., 55 (1913), No. 5–6, pp. 370–392*).—According to the author's observations, oxygen consumption was somewhat lower when arabinose was fed to laboratory animals (dogs) than was the case during fasting. Since it apparently plays no part in the oxidative processes, one may assume that it is stored or used to form other substances, in a way analogous to the formation of glycogen from hexoses.

Some metabolic effects of bathing in the Great Salt Lake, HELEN I. and H. A. MATTILL (*Proc. Amer. Soc. Biol. Chem., 3 (1913), No. 1, p. 25*).—A summary of a paper presented at the eighth annual meeting of the American Society of Biological Chemists at Philadelphia, Pa., in December, 1913.

Two subjects kept on uniform diets were studied. Analysis of the urine showed no variations in total nitrogen attributable to the experimental conditions. Observed variations in the uric acid and ammonia excretion were small. The maximum ammonia nitrogen excretion was observed on the days of longest baths. Creatinin excretion showed a slight rise during the bathing periods, perhaps related to the increased muscular tonus. "Chlorid elimination was considerably increased during the bathing periods, 25 per cent in one case and

28 per cent in the other, and since these variations have no parallel in those of any other metabolic products determined, the possibility of absorption through the skin seems evident."

A new respiratory chamber, A. C. KOLLS and A. S. LOEVENHART (*Proc. Amer. Soc. Biol. Chem., 3 (1913), No. 1, pp. 32, 33*).—A summary of a paper presented at the eighth annual meeting of the American Society of Biological Chemists at Philadelphia, Pa., in December, 1913. A respiratory chamber designed for the purpose of determining the effect of reducing the oxygen of the respired air on the erythrocyte and hemoglobin content of the blood is described.

A self-recording calorimeter for large animals, A. V. and A. M. HILL (*Jour. Physiol., 48 (1914), No. 1, pp. XIII, XIV*).—The authors describe a calorimeter constructed according to the same principle employed in a smaller one previously noted (E. S. R., 29, p. 569). The apparatus consists essentially of two horizontal co-axial iron cylinders separated by an insulating medium of sawdust and kapok wool and is of a size suitable for experiments with a sheep or dog.

A simple and convenient form of bicycle ergometer, C. J. MARTIN (*Jour. Physiol., 48 (1914), No. 1, pp. XV, XVI, fig. 1*).—An ergometer of the brake type is described in which the work done in foot-pounds is calculated from the frictional pull, the circumference of the wheel, and the number of its revolutions.

For the rear wheel of the bicycle is substituted a cast-iron one weighing 22 kg., the friction being supplied by means of a stout linen band passing around the circumference of the wheel, the ends of the band being so attached to spring balances that the friction may be easily adjusted. The advantages claimed for this piece of apparatus are that the subject of the experiment may make all the necessary observations; that "it has an error of less than 1 per cent"; that "the frictional pull is steady and is nearly independent of the velocity, so that it is not necessary to pedal always at a constant rate"; that "the instrument can be adjusted for any rate of work at any pedal revolution desired"; and that "the friction band is quite thin and so does not get hot and vary the pull during the experiment."

ANIMAL PRODUCTION.

Bibliography of physiology (*Bibliographia Physiol., 3. ser., 8 (1912), Nos. 1, pp. 112; 2–3, pp. 113–384; 4, pp. 385–500; Index, pp. 501–613*).—A bibliography of American and foreign works and articles on physiology and biochemistry received during 1912.

On the correlation between the number of mammæ of the dam and size of litter in mammals, R. PEARL (*Proc. Soc. Expt. Biol. and Med., 11 (1913), No. 1, pp. 27–32*).—This includes two papers.

I. *Interracial correlation* (pp. 27–30).—Biometrical methods are applied to an extensive series of statistics regarding size of litter and number of mammæ for many different species of wild and domestic mammals as collected by C. F. Bellingeri in 1849. It is found that "interracially the mean size of litter is approximately two individuals below the mean number of mammæ possessed by the mother. This may be taken as a rough measure of the evolutionary 'factor of safety' in regard to these characters. There is relatively . . . somewhat more variation exhibited in size of litter than in number of mammæ. The correlation between these two characters, as measured by the coefficient *r*, is surprisingly low. This result certainly can not be said to furnish particularly strong evidence that natural selection has had anything to do with fixing the relationship between number of mammæ and size of litter."

II. *Intraracial correlation in swine* (pp. 31, 32).—Biometrical methods are applied to statistics collected by E. N. Wentworth in 1913 on the correlation between number of mammæ and size of litter in Duroc Jersey swine (E. S. R., 29, p. 470). It is shown that "there are approximately 2.5 more mammæ in the dam, on the average, than number of young in the litter in these swine. This is a slightly larger 'factor of safety' than is found interracially. The intraracial correlation between these variables in swine is not only absolutely low but is relatively much lower than the interracial correlation. Again it is not apparent here that natural selection has operated in the expected manner.

"Intraracially, just as interracially, size of litter is relatively a more variable character than number of mammæ in the dam. There is, as would be expected, a very considerable reduction in variability, in respect of both characters, in the single species (intraracial) as compared with the composite group of 90 different species (interracial)."

A note on sex determination, G. H. PARKER (*Science, n. ser., 39 (1914), No. 997, pp. 215, 216*).—In collecting data to show the relation of the size of litters to the number of nipples in swine, observations were made on the position that the young pigs occupied in the uterus and their sex, and it was therefore possible to make a comparison of the products of one ovary with those of the other. A tabulation was made of the frequency of occurrence of pairs of unborn pigs of various combinations of sex at the division of the horns of the uterus next the right ovary and next the left ovary, the observations extending over 2,600 pairs of pigs. In all three positions the frequencies of the pairs were approximately in the ratio of 25 per cent males: 25 per cent females: 50 per cent males and females, showing that in the pig the ovaries exert no influence on the sex of the offspring by virtue of their position in the maternal body.

On the atavistic long stripe of the new-born young of certain breeds of domestic swine, E. A. GOELDI (*9. Cong. Internat. Zool., 1913, pp. 369, 370*).—The author comments on a phenomenon of the atavism of coloration, a long stripe, sometimes found in the young of some of our domestic breeds of swine, as the Berkshire and Yorkshire, and which evidently traces back to the early types of wild swine.

Rudimentary parthenogenesis in the golden pheasant, LÉCAILLON (*Compt. Rend. Acad. Sci. [Paris], 158 (1914), No. 1, pp. 55–57; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 4, pp. 502, 503*).—The author made a study of the unfertilized eggs from a golden pheasant (*Chrysolophus pictus*) to determine whether rudimentary parthenogenesis applies to this species as it does in the case of the hen.

It was found that the cicatricula shows blastomeres of varying size and that these are composed of cytoplasm and deutoplasm and contain normal nuclei. The degeneration of the blastomeres is often characterized by hypertrophy of the nuclei, which form numerous fresh nuclei of various sizes by budding. It is concluded from these observations that unfertilized eggs always show a tendency to develop like fertilized ones.

The distribution of creatin in the bodies of mammals, J. C. BEKER (*Hoppe-Seyler's Ztschr. Physiol. Chem., 87 (1913), No. 1, pp. 21–37*).—Analyses made to determine the creatin and creatinin content of the organs of the cow, goat, pig, rabbit, and dog showed the largest amount of creatinin present in the voluntary muscles and the least in the thymus gland. The fetus shows a low creatin content. The creatinin content increases in animals in advanced pregnancy.

The digestibility of cattle foods, J. B. LINDSEY and P. H. SMITH (*Massachusetts Sta. Bul. 152 (1914), pp. 79–120*).—This bulletin contains the results of 47 single digestion experiments with a variety of cattle feeds. The basal ration consisted of hay, corn, and gluten. The experiments were conducted with sheep.

The average coefficients of the several feeds are given as follows:

Average coefficients of feeding stuffs.

Feed.	Dry matter.	Protein.	Fat.	Nitrogen free extract.	Crude fiber.	Ash.
English hay, June grass (*Poa pratensis*) predominating (late cut)	*P. ct.* 61.68	*P. ct.* 54.43	*P. ct.* 51.12	*P. ct.* 64.87	*P. ct.* 66.89	*P. ct.* 31.78
English hay (early cut)	65.14	62.82	49.30	67.14	68.85	38.43
Dried beef pulp	74.58	51.86	.....	83.48	83.45	25.58
Molasses dried beet pulp	82.34	61.20	.....	90.54	76.99	51.01
Coconut meal	81.94	89.81	102.74	87.24	23.36	64.04
Cotton-seed feed meal	58.23	75.31	100.61	61.20	26.10	49.37
Wheat screenings	66.76	62.64	90.09	81.83	.....	.....
Wheat screenings (contain more fiber)	59.11	80.93	86.80	64.55	.....	26.73
Flax shives	45.38	81.03	92.68	43.45	25.79	22.78
Cacao shells	57.52	11.47	100.48	73.46	50.66	13.64
English hay and corn meal (5½:1)	70.09	63.00	58.69	74.18	70.76	42.68
Timothy, red top, and clover mixed	59.06	50.38	39.93	58.81	64.85	42.61
Fish meal	67.72	75.14	101.32	.....	.....	28.58
Fish guano	74.58	81.10	108.03	.....	.....	32.06
Molasses meal and sphagnum moss	61.98	41.74	.....	71.90	.....	79.48
English hay and gluten feed (550:150)	66.37	68.35	56.33	70.02	65.64	30.81

The utilization of Para rubber seed (*Bul. Imp. Inst.* [*So. Kensington*], *11 (1913), No. 4, pp. 551–559; abs. in Agr. Bul. Fed. Malay States, 2 (1914), No. 8, pp. 213–215*).—Sheep and cattle feeding experiments with Para rubber seed cake are reported.

All attempts at feeding sheep with the cake failed. Cattle ate it readily but when the quantity was increased to 8 lbs. per head daily scouring occurred. With dairy cattle fed on Para rubber seed cake the yield of milk rose, but the percentage of milk fat remained unchanged.

The composition of the cake is given as follows: Moisture 8.75 per cent, protein 30.19, fat 8.71, carbohydrates 41.71, crude fiber 5.01, ash 5.6 per cent, and feed units 139. A small quantity of cyanogenetic glucosid was present, yielding approximately 0.02 per cent prussic acid, a negligible quantity.

Studies on the nutritive requirements for fattening mature cattle and sheep.—Feeding experiments with heated liquid potato distillery refuse and with dried refuse in comparison with palm-nut cake, W. Völtz, J. Paechtner, A. Baudrexel, W. Dietrich, and A. Deutschland (*Landw. Jahrb., 45 (1913), No. 3, pp. 325–437, pls. 8, fig. 1*).—Analyses of malt sprouts, dried brewers' grains, potato flakes, potato refuse from distilleries, and palm-nut cake are reported. The water-free potato refuse contained 25.47 per cent of protein, 0.68 fat, 53.15 nitrogen-free extract, 6.94 crude fiber, and 13.76 ash.

Two lots of 5 head each of yearling Hampshire wethers were fed during a 164-day feeding period on a basal ration consisting of millet hay, oat straw, malt sprouts, brewers' grains, and potato flakes; lot 1 receiving potato refuse and lot 2 palm-nut cake. During the last 45 days of the period molasses was added to both rations. The total increase in weight per head for lot 1 was 15.26 kg. and for lot 2, 18.16 kg.; the dry substance consumed per head per day by lot 1, 1,072.2 gm. and lot 2, 1,075.1 gm.; and the estimated starch value required per kilogram of grain 5.22 kg. for lot 1, and 4.59 kg. for lot 2. The dressing percentage was 51.2 and 50.2 per cent, and the intestinal fat 2.3 and 1.85 per cent, respectively.

It is concluded that feeding stuffs have a specific value independent of their starch value, and that molasses added to the ration has a specific value in increasing the nutritive value of the ration for sheep and cattle.

Comparing the digestibility of feeds for ewes and wethers it was found that on the potato refuse ration the ewe utilized 4 per cent more organic matter than the wether, while on the palm-nut cake ration the utilization of organic matter, protein, and nitrogen-free extract was practically the same for both ewe and wether. The digestibility of the potato refuse was 54.7 per cent for the ewe and 59.8 per cent for the wether; for the palm-nut cake 58.7 and 56.3 per cent.

Complete digestion trials were made with one bull and two sheep. It was found that a 2- to 3-year-old bull required per day per 1,000 kg. live weight, 21 kg. dry substance, 1.9 kg. digestible protein, and 10 kg. digestible nitrogen-free extract, or the equivalent of 45,000 usable calories of energy or 8.5 kg. starch value; a yearling wether 28.5 kg. dry substance, 2.9 kg. digestible protein, and 14 kg. nitrogen-free extract, or the equivalent of 70,000 usable calories or 13.5 kg. starch value. On the potato refuse ration the value of the feed was greater for the bull than for the sheep, 29 per cent less digestible protein and 26 per cent less starch value being required. On the palm-nut ration the differences were less marked; on the palm-nut molasses ration the value of the feed was higher for sheep than for cattle. Cattle showed a higher resorption of protein fats and fiber. The physiological value of the control-mixed feed, the potato refuse ration, and the palm-nut cake ration was higher for the sheep than for cattle, and the potato refuse molasses higher for the cattle.

The heated liquid refuse had a slightly higher nutritive value than the dried refuse and cold water. The addition of lactic acid to the ration lowered the nutritive value and hastened the protein transformation.

It is concluded that the actual starch value of feeds is a very variable quantity, depending upon the individuality of the animals. From these trials it is estimated that the gains made by cattle from 100 kg. starch value of potato refuse were 30.9 kg., of potato refuse and molasses 21.7, palm-nut cake 31.2, and palm-nut cake and molasses 22.4 kg.; and for sheep on these feeds 16.7, 20.5, 19.9, and 25 kg., respectively.

Proceedings of the American National Live Stock Association, 1914 (*Proc. Amer. Nat. Live Stock Assoc., 17 (1914), pp. 156, pls. 12*).—This reports the proceedings of the seventeenth annual convention of this association, held at Denver, Colo., in January, 1914, and includes addresses on the future cattle supply of the United States, effect of free trade in live stock and meats on prices, railway rates and service, grazing on national forests, etc.

The breeds of pure-bred live stock (*Montana Sta. Spec. Circ. [1] (1913), pp. 9*).—This includes a list of the breeds of pure bred live stock, their American record association, and the secretary of the association.

A list of breeders of pure-bred live stock in Montana (*Montana Sta. Spec. Circ. 2 (1914), pp. 23*).—This circular gives a list of breeders of pure bred live stock of the several counties of Montana.

On the growth of pasture animals, K. G. Bruchholz (*Deut. Landw. Tierzucht, 18 (1914), No. 16, pp. 185–187*).—This reports studies made of the increase in breast measurement and increase in weight of calves on pasture.

Dung making experiment, 1912–13, J. A. Voelcker (*Jour. Roy. Agr. Soc. England, 74 (1913), pp. 410, 411*).—Four bullocks were placed in special stalls and fed a mixed ration of bean meal and crushed oats, together with roots, oat straw, and chaff for a period of 130 days. During the time two of the bullocks received in addition 1 ton of hay.

It is estimated that the animals in stall 1, receiving no hay, produced 204.69 cu. ft. of manure, weighing 10,595 lbs., those of stall 2 receiving hay, 259.87 cu. ft., weighing 13,564 lbs. The moisture content of the former was 75.82 per cent, of the latter 74.21; the nitrogen contents 0.489 and 0.615 per cent, respec-

tively. A distinctly better grade of manure was thus procured from the hay-fed animals.

Cattle and carabao in the Philippines, G. E. ANDERSON (*Daily Cons. and Trade Rpts. [U. S.], 17 (1914), No. 125, p. 1166*).—It is stated that the shipment of cattle to the Philippines from Hongkong and from Australia has been one of the chief items of trade. However, the rate at which cattle and carabaos in the Philippines are increasing indicates that the Islands are soon to be at least self supporting.

Individual variation in musk oxen, J. A. ALLEN (*9. Cong. Internat. Zool., 1913, pp. 210–215*).—A discussion of the skeletal measurements and weights of musk oxen.

It is concluded that "the range of individual variation in cranial characters in musk oxen, in both males and females, is greater during the period from 5 to 8 years of age than later. It is much greater in males than in females. The length of the tooth row is more variable than is the relative breadth of the skull (at given points) to the basal length. The nasal bones, in respect to length, breadth, and convexity, are among the most variable elements of the skull, and the most untrustworthy for use in diagnosis. The lacrymal bones are also subject to great variation in size and form, and especially in respect to the depth of the lacrymal depression ('fossa' or 'pit').

"Naturally the highest ratio of variability is shown in the horns—in their curvature, length, breadth at base, and general massiveness. The weight of the skull in animals of the same age and sex is subject to great variation, amounting to 80 per cent of the mean weight in a comparable series of 26 male skulls, and about 45 per cent in 22 skulls of females. The range of individual variation often exceeds the average differentiation between well-marked subspecies, or even the average differentiation between closely allied congeneric species."

Management and feeding of sheep, T. SHAW (*New York and London, 1914, pp. XXXIX+471, figs. 24*).—This book treats of the feeding, care, and management of sheep and the classification and characteristics of wool.

Breeds of Scottish sheep.—I, Cheviots, W. BARBER (*Trans. Highland and Agr. Soc. Scot., 5. ser., 26 (1914), pp. 102–146, pls. 4*).—The origin and early development of the Cheviot breed of sheep in England and Scotland, their present status, and utility value are discussed.

Breeds of Scottish sheep.—II, Half-bred sheep, R. MACMILLAN (*Trans. Highland and Agr. Soc. Scot., 5. ser., 26 (1914), pp. 146–150, figs. 3*).—In this article the author treats of the so-called "half-bred" sheep of South Scotland and North England. These sheep are a cross between the Cheviot and Border Leicester and through years of selection have become a distinct breed. The sheep are of great size and hardiness and are deemed of distinct value to the general purpose farmer.

Domestic sheep and their wild ancestors.—II, Wild sheep of the Argali type, J. C. EWART (*Trans. Highland and Agr. Soc. Scot., 5. scr., 26 (1914), pp. 74–101, pls. 8*).—In this paper, which is a continuation of work previously noted (E. S. R., 29, p. 469) the author presents further evidence showing the relation between the wild sheep of the Argali type and the present-day domestic sheep, and concludes that "even before the coming of the Romans, Britain had sheep which included the Argali as well as the Urial and Mouflon amongst their ancestors."

Some early references to four-horned sheep in Scotland, J. RITCHIE (*Scot. Nat., No. 29 (1914), pp. 100–106*).—From a review of early references to four-horned sheep it is concluded "that an early breed of Scottish sheep was distinguished by its small size of body, by the fineness of its wool and the shortness

of its tail, by its horned ewes, and the frequent occurrence, especially among the rams, of horns in groups of 4 or more. These characters have persisted in common since at latest the middle of the sixteenth century till the present day."

It is presumed that improved breeds by a process of selection have gradually usurped the place of the more primitive race.

[Pig-feeding experiments]. J. M. SCOTT (*Florida Sta. Rpt. 1913, pp. XVII–XIX*).—Two lots of four 75-lb. pigs each were fed during 46 days as follows: Lot 1, shelled corn and green cowpeas; lot 2, corn and green sorghum, equal amounts by weight being fed so that for each pound of corn a pound of green feed was given. Lot 1 made an average daily gain per head of 0.43 lb., costing 12.2 cts. per pound of gain; lot 2, 0.36 lb., costing 14.7 cts. per pound.

Three lots of pigs were fed during 43 days as follows: Lot 1, shelled corn and green rape; lot 2, shelled corn and peanuts 3:1, with green rape; lot 3, shelled corn and peanuts 1:1 with green rape. Lot 1 made an average daily gain per head of 0.686 lb. costing 13.9 cts. per pound of gain; lot 2, 0.72 lb., costing 14.6 cts. per pound; and lot 3, 0.774 lb., costing 15.6 cts. per pound of gain. It is noted that as the amount of the peanuts in the ration was increased there was a noticeable increase in the average daily gains, but likewise an increase in the cost, and indicating that for pork production peanuts are worth only about 30 or 40 cts. per bushel.

Growing hogs in Mississippi, E. M. RANCK (*Mississippi Sta. Circ., 1914, June 20, pp. 17*).—General directions for the breeding, feeding, care, and management of hogs under Mississippi conditions, including hog diseases and a text of a new state law relating to the quarantine and burial of diseased animals, are given. A table showing rotations of forage crops, supplemental feed, etc., is included.

Swine husbandry in Washington, R. C. ASHBY and C. F. MONROE (*Washington Sta. Popular Bul. 63 (1914), pp. 36, fig. 1*).—A popular bulletin on swine husbandry, including methods of feeding, breeding, diseases, and general management.

Forty years' experience of a practical hog man, A. J. LOVEJOY (*Springfield, Ill., 1914, pp. 170, figs. 29*).—This is a practical treatise on the care, feeding, and management of swine.

Studies on the proportions of the horse, L. VAN MELDERT (*Ann. Gembloux, 24 (1914), Nos. 3, pp. 121–151, figs. 2; 5, pp. 249–274, figs. 4*).—This article reviews the history and development of the horse and the origin of the different types and classes. Various body measurements of the several types of horses are given and comparisons made in their slope and measurement of shoulder, formation of croup, and other points of conformation.

Comparative digestion experiments on Equidæ, O. FRANK (*Kühn Arch., 3 (1913), pt. 2, pp. 363–396; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 2, pp. 241, 242*).—In 10-day feeding experiments with horses, asses, and their hybrids notable differences were noted in their relative power to utilize feed. Of the horses, the mare, belonging to a thrifty country breed (Belgian), digested the feed, with the exception of protein, better than a Mongolian gelding. In the utilization of crude fiber, fat, and nitrogen-free extract the mules and hinnies were superior to the gelding and inferior to the mare.

It is concluded from these observations that thrifty breeds of horses can compete in thriftiness with mules. The author has also calculated how much feed each animal consumed per unit of body surface and found that the smaller animal requires the greater energy to keep up its vital processes.

Poultry culture, W. H. DAVENPORT, J. H. ROBINSON, H. D. SMITH, J. C. GRAHAM, and J. E. RICE (*Mass. Bd. Agr. Bul. 1 (1914), 4. ed. rev., pp. 158,*

pls. 11, figs. 26).—This bulletin is a compilation of articles treating of general poultry topics, including breeds for the farm, poultry housing, hatching and rearing chicks, feeding and management for egg production, and other related subjects.

Relation between the rotting and age of hens' eggs, H. KÜHL (*Hyg. Rundschau, 24 (1914), No. 5, pp. 253–259*).—The author advocates the control of market eggs and the establishment of grades based upon specific weight. The specific weight of absolutely fresh eggs is found to range between 1.035 and 1.06 and that of comparatively fresh eggs not older than 8 to 10 days between 1.015 and 1.035. Among the factors influencing the rotting of eggs are bacterial infection from packing, as in hay, and the temperature and condition of the room in which eggs are kept.

Practical rabbit keeping, G. A. TOWNSEND (*London, New York, Toronto, and Melbourne, 1912, pp. XIV+299, pls. 20, figs. 13*).—This book treats of the breeding, feed, care, and management of the various breeds of domestic rabbits.

The culture of black and silver foxes, R. B. and L. V. CROFT (*Woodstock, Ontario, 1913, pp. 83, figs. 29*).—This pamphlet relates to the breeding, feed, care, and management of black and silver foxes for commercial purposes.

DAIRY FARMING—DAIRYING.

Evolution in judging dairy cattle in Denmark, J. J. DUNNE (*Hoard's Dairyman, 48 (1914), Nos. 3, p. 52, figs. 8; 7, pp. 166–168*).—The author reviews the development of judging of dairy cattle in Denmark. In 1847, during the Guenon period, the "indications" (milk mirror largely) outweighed all other considerations, counting 67 per cent, with build and size 12.5 and milk appearance (frame, skin, etc.) 20.5. In 1852, when the Guenon storm had partially subsided, the build and size quadrupled in importance, the milk appearance increased to 25, and the indications (milk mirror) came down to 25 per cent. In 1869 there occurred a reaction in favor of the indications at the expense mainly of the "appearance," these being rated at 40 and 15, respectively.

In 1887 the appearance came back into favor (33.3) and a new consideration (ancestry) was created (11.2) at the expense of the build and the milk indications (33.3 and 22.2, respectively). In 1890, the commissioners of the state-animal shows attached more importance to the ancestry of bulls, while the same body, in 1906, added additional points to ancestry and offspring (28) and equalized the points awarded to the other three groups (24 each), and giving, for the first time, some consideration to the performance. In 1908, build and size reasserted their importance (40), while appearance and indications dropped to 10 each, ancestry to 20, and individual performance was set down at 20 per cent for the first time. Another slight change in 1913 reduced ancestry to 15, and increased performance to 25.

Comparison of milk yield of cows calving fall and spring, E. J. WOODWARD (*Hoard's Dairyman, 48 (1914), No. 7, p. 165, fig. 1*).—The records of 18 pure-bred dairy cows calving in September and October were compared with those of 18 cows calving in April and May, the cows of both groups being quite uniform as far as breeding and individuality were concerned.

It is shown that for the first few months the decline in milk flow for the two groups was quite constant, but that seven or eight months after calving, or at the opening of spring, the group calving in the fall showed decidedly less decline than did the spring-calving group when equally advanced in lactation. "During the tenth month as platted, the average milk yield of the cows in the fall-calving group was 58 per cent of their yield for the first complete calendar month as against 35 per cent for the group which calved in the spring. The

production for the first complete calendar month for the spring-calving group was 1,104 lbs., for the fall-calving group 1,017 lbs. Yet the group calving in the fall gave an average total milk yield of 8,149 in the 10 months, while the group calving in the spring averaged for the same time 7,364 lbs."

The most profitable calving time, J. J. DUNNE (*Dept. Agr. and Tech. Instr. Ireland Jour., 14 (1914), No. 4, pp. 725–728*).—Summarizing the results of four competitions between entire herds of Red Danish dairy cows, each competition covering a period of two years, it was found that cows that calved during the quarter, October, November, and December, gave an average of 160 gal. more milk during the period of lactation than did those that calved during the quarter, April, May, and June, but comparing the average of the winter half-year, October to March, with that of the summer half-year, April to September, 96 gal. more milk. This is thought to be due to the uniformity of the nutrient values of the daily feed during the winter in contrast to the variability of those of summer feeds. It is shown that two-thirds of the 34,217 cows belonging to cow-testing associations in 1912–13 calved during the winter half of the year.

[Feeding experiments with silver beet], A. MACPHERSON (*Jour. Agr. [New Zeal.], 8 (1914), No. 4, pp. 379–387, figs. 7*).—Milch cows foraged during the morning and afternoon on silver-beet, or Swiss chard, ate it greedily, did not scour, and maintained their milk flow throughout a 12-day feeding period.

Production of clean milk (*U. S. Dept. Agr., Farmers' Bul. 602 (1914), pp. 18, figs. 6*).—This gives general information on the essential factors in producing clean milk.

Removal of garlic flavor from milk and cream, S. H. AYERS and W. T. JOHNSON, JR. (*U. S. Dept. Agr., Farmers' Bul. 608 (1914), pp. 4, fig. 1*).—A process of removing garlic flavor from milk which proves successful consists in blowing air through milk which is heated to at least 145° F. The flavor was removed in from 30 to 60 minutes from milk from a cow fed 0.75 lb. wild garlic 20 minutes before milking. It was found to require a slightly longer blowing period to remove the flavor from cream. While the flavor was more quickly removed at 160°, a cooked taste was produced.

The apparatus used in this process is described and its adaptation for commercial use discussed.

A home pasteurizer (*Ill. State Food Com. Bul. 31 (1914), pp. 4, figs. 4*).—A description of the construction of a pasteurizer for home purposes.

Milk cans should be jacketed (*Milk Dealer, 3 (1914), No. 12, pp. 38*).—In experiments conducted by this Department in shipping milk at 50° F., hauling a distance of 13 miles in an open truck and exposing to the direct rays of the sun at a temperature of approximately 83°, it was found that the milk in cans that were hair-quilt jacketed showed a raise of only 5½° temperature in three hours. The milk in cans that were wrapped with wet burlap showed a raise of 8½°, and the milk in unjacketed cans rose 28½°.

The cytology and bacteriology of condensed milks, F. W. ANDREWES (*Jour. Path. and Bact., 18 (1913), No. 2, pp. 169–178*).—From cell counts made of condensed milk it is concluded that none of the samples examined contained, in spite of the questionable appearance of the stained sediment of some specimens, pus cells in sufficient quantity to cause suspicion.

As regards bacteriology, it is plain that a machine-skimmed, sweetened, condensed milk can not be expected to be sterile. The author regards "the presence, in reasonable number, of the bacteria commonly found in fresh milk—*Bacillus coli*, streptococci, a few staphylococci, and *B. enteritidis sporogenes*—and of such ordinary air contaminations as *B. subtilis* and *mesentericus*," as

comparatively unobjectionable. A large proportion of the bacteria of milk seem to be destroyed in the process of condensation. It was demonstrated that "condensed milk is almost a differential medium for the growth of staphylococci. It would appear that if only a few *Staphylococcus pyogenes aureus* were present, and escaped destruction in the process of condensation, there is no limit to the number which, later, may be found on opening the tin. [However, their presence] in large numbers in a condensed milk is objectionable and should probably constitute a ground for condemnation, even though the potential harmfulness of such a product is unproven. Efficient pasteurization, before condensation and before the addition of sugar, should prevent the presence of such organisms in the final product, however difficult it may be to destroy them afterwards, for in the majority of condensed milks they are absent or but scantily present."

Condensed milk (*Food and Drugs, n. ser., 2 (1914), No. 3, pp. 133–142*).—This article deals with the various types of sweetened and unsweetened condensed milk, their composition, nutritive value, and bacterial content.

Kefir, J. C. LANDIN (*Bul. Sci. Pharmacol., 21 (1914), Nos. 6, pp. 356–363, figs. 5; 7, pp. 400–409*).—A treatise on the bacteriological characteristics of kefir, a fermented-milk food, and the importance in pathological conditions of the various bacteria and acids in the digestive processes.

Fermented-milk product and process of making the same, A. H. THOUMAIAN (*U. S. Patent, 1,101,044, June 23, 1914; abs. in Jour. Soc. Chem. Indus., 33 (1914), No. 15, p. 803*).—"A mixture of egg albumin, milk, and cream is submitted to the action of a culture of the lactic acid bacillus and *Bacillus bulgaricus*."

The normal bacteria of Swiss cheese, E. E. ELDRIDGE and L. A. ROGERS (*Abs. in Science, n. ser., 38 (1913), No. 976, pp. 377, 378*).—Studies were made in this Department of a large number of cultures isolated from various cheeses, particularly in relation to their fermentative abilities. Three morphological groups were separated, short rods which predominated at the beginning of the ripening, long rods which appeared in the early ripening stages and increased steadily, and cocci which appeared in small numbers in the cheese at an age of five or six weeks. It is stated that "the essential bacteria of Emmental cheese are evidently not ubiquitous. In two widely separated localities cheeses made without inoculation have invariably failed to give the normal fermentation. Cheese made from milk inoculated with a mixture of a large number of pure cultures, or from special culture media inoculated with good cheese, have given uniformly a normal ripening."

The action of Bacillus bulgaricus in suppressing gassy fermentations in cheese making, C. F. DOANE (*Abs. in Science, n. ser., 38 (1913), No. 976, p. 377*).—From studies conducted in this Department, "it was found that pure cultures of *B. bulgaricus* could be used with perfect results in suppressing the undesirable fermentations, principally gas, which have worried Swiss cheese makers in the past. There seems to be a difference in the efficiency of different strains of *B. bulgaricus* for this purpose without respect to their activity in forming acid. One per cent of a whey starter made from one culture was sufficient, while it requires three per cent of another. The *B. bulgaricus* starters could not be seen to have any effect on the formation of the eyes or interfere with the flavor or texture. It is believed that the proper use of *B. bulgaricus* starters will go far toward making a more uniform cheese during the summer months and will make it possible to produce good Swiss cheese during the entire year."

Notes on yeast-like organisms in whey, S. F. EDWARDS (*Abs. in Science, n. ser., 38 (1913), No. 976, pp. 376, 377*).—In studies made at the Ontario Agricul-

tural College, 12 varieties of yeast-like organisms were isolated from samples of whey coming from cheese having a fruity or sweet flavor. Three lots of experimental cheese were made up, using a starter of these organisms, and the flavors typical of different factories were produced. It is stated that the term yeast as applied to these organisms is a misnomer, for with but one exception spore production was not demonstrated. A table is given showing the cultural and biological characters of these organisms.

The preparation of dried cultures, L. A. ROGERS (*Abs. in Science, n. ser., 38 (1913), No. 976, p. 377*).—A method of drying cultures of lactic acid bacteria, *Bacillus bulgaricus*, and other organisms is described. It is stated that the activity of a dried culture diminishes more or less rapidly, depending upon moisture content, temperature, and presence of air or oxygen.

Purification and disposal of waste water from dairies, DORNIC, DAIRE, and VIGNEROT (*Ann. Sci. Agron., 4. ser., 3 (1914), No. 4, pp. 150–170, figs. 3*).—The chief object in the purification of waste water from dairies is the reduction of the casein, and the three methods of purification are the chemical, the biological, and the filter-bed. The last-named is deemed the most satisfactory in the majority of cases.

Reduction by chemical means of the nitrogenous matter in the waste water from dairies has been obtained with reagents as follows: Aluminum sulphate and lime 67.5 and 69.6 per cent; perchlorid of iron and lime 25.8 per cent; ferrous sulphate and lime 67.5 per cent; and ferric sulphate, aluminum sulphate, and lime 75.3 per cent. Daire's new chemical process, which is in operation, is described and declared to have given complete satisfaction. In plants where the water is not too rich in serum, anaerobic fermentation in septic pits may be employed. Irrigation of forage and vegetable crops may be employed where the water outflow is of sufficient quantity.

Purification of the residuary waters of the creamery, CALMETTE and E. ROLANTS (*Min. Agr. [France], Ann. Forêts, Hydraul. [etc.], No. 44 (1912), pp. 131–137*).—An account of methods of purifying creamery-waste water by neutralizing the acids in the water and precipitating the organic material with ferric sulphate.

VETERINARY MEDICINE.

Lipoid anaphylaxis, F. P. WILSON (*Jour. Path. and Bact., 18 (1913), No. 2, pp. 163–168*).—Attempts to sensitize guinea pigs to lipoids having various properties and extracted from the livers of rabbits gave negative results. "Lipoids extracted from egg yolk in a similar manner, and which differed considerably from the liver lipoids, also failed to produce anaphylaxis. Some doubtful evidence was obtained that a pure lipoid from one source might sensitize an animal to a lipoid of different origin.

"Dried liver substance and dried egg yolk do not sensitize to lipoids derived from these substances. Lipoids from yolk of egg sensitize animals to dried liver substance, but liver lipoids will not sensitize to dried egg yolk. Pure lipoids from any substance will sensitize an animal to a crude extract of the substance, but repeated injections of pure lipoids do not produce anaphylaxis."

Some further contributions to the knowledge of vegetable hemagglutinins, I. L. WAKULENKO (*Landw. Vers. Stat., 82 (1913), No. 5–6, pp. 313–391*).—The lipases prepared by Jalander's and Falk and Nelson's (E. S. R., 27, p. 712) methods have both lipolytic and blood agglutinating properties. The lipase is also capable of cleaving esters, glucosids, and high molecular carbohydrates hydrolytically. The reactions upon the blood caused by ricin are said to be due to the presence of enzyms. This view has already been put forth by Neuberg. Whether a universal enzym accounts for all of the above phenomena and

whether the reactions are identical with those brought about by a purified enzym (ricin), prepared according to Osborne's method, must be the subject of further investigation.

In nontoxic agglutinins, e. g., robin, robin-seed phasin, and robin-seed urease, various enzyms are present and consequently the agglutinating properties possessed by phasin are similar to those possessed by enzyms. No urease was noted in castor-bean lipase, nor was sinigrin cleavage, as observed by Power, noted with filtered and aseptic robin-bark enzym preparations. Kobert on a previous occasion has shown that the robin obtained from the bark of *Robinia pseudacacia* and that of robin-seed phasin were not identical. The preparation from the bark contained amylase and invertase while robin urease contained only amylase. Glucosid- and salol (ester)-cleaving enzyms were absent. Tannigen was cleaved but the most intense cleavage was with the urease prepared from robin seeds.

Enzyms were also noted in soy-bean phasin obtained from three varieties of beans. These were hydrolytic for certain carbohydrates, glucosids, esters, and urea. The blue lupine seed phasin contained diastatic enzyms and glucosid- and urea-cleaving enzyms in addition to the agglutinins. *Phaseolus mungo* did not agglutinate calf, adult bovine, horse, sheep, or goat corpuscles, but cat, rabbit, dog, pigeon, and human blood were agglutinated. The strongest action was on pigeon blood. The phasin from *P. maximus* agglutinated human, hog, horse, cat, and pigeon blood but not rabbit, dog, calf, adult bovine, sheep, or goat blood. *P. mungo* seeds contained invertase, amygdalase, helicase, and tannigenase. The seeds of *Sphenostylis stenocarpa*, which according to Kobert contain an agglutinating phasin, also had saccharose-, glucosid-, and tannigen-cleaving enzyms. Starch, glycogen, inulin, lactose, salol, and urea were not hydrolyzed by this seed.

Other plants studied in the above respects were *Voandzeia subterranea*, *Arachis hypogæa*, *Datura stramonium*, *Digitalis purpurea*, *Delphinium consolida*, *Atriplex hortensis*, *Strophanthus gratus*, *S. hispidus*, *S. combé*, sesame cake, apple seed, lemon seed, China orange seed, canary grass seed, and alder seed. The common feed cakes, namely, coconut, linseed, palm-nut, cotton-seed, and mowrah cakes, pea flour, and *P. erectus* gave negative results.

The poisonous constituent of the bark of Robinia pseudacacia, F. B. POWER (*Amer. Jour. Pharm., 85 (1913), No. 8, pp. 339–344*).—A polemic in regard to statements made by Kobert (E. S. R., 30, p. 204) with reference to the toxicity of robin.

A recent retest of the protein isolated in 1904 showed it to be very toxic; consequently Kobert's assertion that robin is a nonpoisonous phasin is deemed inaccurate. Other statements made by Kobert are also criticized.

In regard to the chemical nature and biological properties of ricin, G. REID (*Landw. Vers. Stat., 82 (1913), No. 5–6, pp. 393–414*).—A. Cushny and F. Muller, working independently, as a result of their researches came to the conclusion that ricin is not a definite substance but is a mixture made up of an agglutinin and a toxin. Lau,[a] on the other hand, showed that ricin was capable of combining with red blood cells and also with other body cells rich in lipoids. In this work the author attempted to prove Lau's contention that ricin is a unit substance which has both toxic and agglutinating properties.

The tests were made with isolated brain, liver, spleen, and kidney cells, small intestinal cells, and thymus cells. Ricin became anchored to these cells and agglutinated them (macroscopically) in much the same manner as blood cells are agglutinated by this substance. When the ricinized cells were treated with

[a] Über Vegetabilische Blutagglutinine. Inaug. Diss., Univ. Rostock, 1901.

dilute hydrochloric acid the ricin which had become absorbed was liberated and again capable of agglutinating red blood cells of cats. Similar results were obtained with ricin and bean phasin (Merck) purchased on the market. Lecithin and cholesterol did not hinder agglutination of organ or blood cells by ricin.

Digestion experiments with pepsin-hydrochloric acid solution did not weaken the agglutinating properties of ricin but the presence of peptone seemed to delay its action. Vicarious elimination into the stomach of frogs and turtles could not be detected with the agglutination test in these experiments, but it is believed that it may take place if ricin is injected subcutaneously in large doses.

A short contribution to our knowledge of the action of abrin, A. SOMMERFELD (*Landw. Vers. Stat., 82 (1913), No. 5–6, pp. 415–426*).—Abrin, from *Abrus precatorius*, like ricin is fixed by brain and similar cells and can not be washed from the cells with physiological salt solution. It is also considered a unit substance which has both toxic and agglutinating properties. Seeds 30 years old were still found to possess some of the agglutinating property. Formaldehyde in all concentrations is not inhibitory for abrin action.

The white blood cells (formalinized and nonformalinized) from the thymus of a calf also fixed abrin and the addition of hydrochloric acid to these cells freed the abrin, which in turn will agglutinate the red blood cells of man. Agglutination could also be induced with pus cells obtained from a cold abscess.

The hydropic degeneration of the fibers of heart muscle of guinea pigs and rabbits as noted by Schmorl could not be produced even though large quantities were used. The macroscopical findings with rabbits and guinea pigs after poisoning with abrin resembled those of ricin poisoning very closely. The lymph nodules in the abdominal cavity were swollen and there was often evidence of hemorrhage present. The microscopical examination of the abdominal organs showed a degeneration in the lymph nodules and in the lymph follicles of the digestive tract. Hemorrhagic areas were noted in the kidneys but in most instances the uriniferous tubules were intact.

About the poisonous substances in the seeds of Jatropha curcas, J. FELKE (*Landw. Vers. Stat., 82 (1913), No. 5–6, pp. 427–463*).—This work is along the same lines as that noted in the abstract above. The seeds also contain a toxalbumin, curcin, which does not affect the red blood cells in vitro, but in vivo it has a marked effect upon these cells.

The oil owes its toxicity to an acid which is called curanolic acid and which is prepared in the same manner as the crotonic acid from croton seeds. It is a drastic and produces a marked gastrointestinal inflammation in both man and beast. The probability exists that curcin is destroyed in the gastrointestinal tract and is consequently robbed of its toxicity.

The use of salvarsan in nonsyphilitic diseases, W. H. BEST (*Jour. Amer. Med. Assoc., 63 (1914), No. 5, pp. 375–380*).—From the study reported the following conclusions are drawn:

Salvarsan is specific in diseases caused by any variety of spirillum. It has curative properties in those diseases in which the infecting organisms are found in the blood or lymph, or in other locations where they can be easily reached. It has great therapeutic value in those diseases in which arsenic has been successfully used, and if used with caution in repeated doses over a long period has a therapeutic value in those diseases in which previously arsenic gave indifferent results. Salvarsan, used as an adjuvant to some other drug or drugs, is useful in those diseases in which a decided and quick tonic, stimulating, and alterative effect is desired, depending on the other drug or drugs for the ultimate result.

"The mode of administration is important, and should be as follows: Intravenous in those diseases in which a specific action is desired; full dose intramuscular injections, repeated once or twice at long intervals (eight weeks), in those cases in which the tonic, stimulating, and alterative effect is desired, as well as a certain specific action; small oft-repeated (week or ten days) doses, intramuscularly, over a long period of time, in those chronic diseases in which a purely tonic, stimulating, and alterative effect is desired."

The control of fluid in cattle dipping tanks, C. WILLIAMS (*Agr. Jour. Union So. Africa, 8 (1914), No. 1, pp. 12–17*).—In this paper the author presents a short review of the work hitherto published on the subject and gives the results of investigations that have been continued since publication of the article previously noted (E. S. R., 29, p. 585). It is stated that the conclusions drawn in the previous article have been fully confirmed by the subsequent investigations.

"During the winter season the amount of arsenite in the tank only fell from 0.144 per cent to 0.134 per cent in 2½ months, whereas during an equal period of time in the summer the proportion of arsenite dropped from 0.138 per cent to 0.109 per cent, thus showing that oxidation takes place to a greater extent in the hot summer months than in the winter. . . . [In the winter] . . . bacterial activity was only apparent during the first month (May 22 to June 22), for after the latter date no signs of oxidation were detected. It may be also pointed out that very little dipping was taking place during the winter months, which circumstance in itself would favor oxidation than otherwise."

The investigations show that 10 gm. of sodium sulphite per 2,000 cc. of dip fluid has very little effect in arresting oxidation, and that the same is true of 1 gm. of either carbolic acid or one of the more common coal tar disinfectants. "By increasing the amounts of these two latter disinfectants to 10 gm. per 2,000 cc. of dip fluid the oxidation was very largely arrested. Under ordinary conditions this proportion could be materially lessened, seeing that the oxidizing action is much more powerful in vessels standing in the laboratory than in dipping tanks, even when the latter are used only at comparatively long intervals."

Oxidation of arsenical dipping fluids, A. G. HOLBOROW (*Rhodesia Agr. Jour., 11 (1914), No. 4, pp. 579–581*).—Analyses made of the contents of three dipping tanks that were in constant use show that the amount of oxidation of sodium arsenite to sodium arsenate is neither constant nor regular but varies somewhat at different times. The author concludes "that there is no necessity to renew a dip in which a fair number of cattle are constantly dipped at short intervals until it has become too dirty for use."

Arsenical cattle dips: Methods of preparation and directions for use, R. M. CHAPIN (*U. S. Dept. Agr., Farmers' Bul. 603 (1914), pp. 16, fig. 1*).—This publication, which is intended to be a handbook for the user of arsenical cattle dips, includes general information, formulas, tables, and practical hints bearing on the preparation and management of arsenical dipping solutions.

Summary of experiments in the transmission of anthrax by biting flies, M. B. MITZMAIN (*Pub. Health Serv. U. S., Hyg. Lab. Bul. 94 (1914), pp. 41–48*).—The author states that the stable fly (*Stomoxys calcitrans*) as well as *Tabanus striatus* can be induced to feed on animals dying of anthrax and also upon their bodies a short time after death. It has been observed in the Philippines, however, that the stable fly does not, except under artificial conditions, attack the carcass of an animal whether recently dead or opened and exposed for some time.

In experiments conducted with a view to settling the question of fecal contamination it was found that only the vegetative form of the anthrax bacillus could be demonstrated throughout the entire series, either in the body of the

insect or in the fecal deposits. The virulence of the organisms present was demonstrated by the results with the animals inoculated from suspensions of agar cultures, there being a uniform fatality from the material used beginning with the three hours up to and including nine days. "Beginning with the cultures of feces made after the ninth day following the infective meal, all proved avirulent as far as animal inoculation was concerned. All of the ordinary cultural and morphological tests were positive from the ninth day to the twentieth day with the material obtained from *S. calcitrans*, and from the sixth to the tenth day with material obtained from *T. striatus*."

See also a previous note (E. S. R., 30, p. 780).

A case of myiasis aurium accompanying the radical mastoid operation, G. M. COATES (*Jour. Amer. Med. Assoc., 63 (1914), No. 6, pp. 479, 480*).—The screw-worm (*Compsomyia macellaria*) is thought to have been the parasite concerned.

Collected studies on the insect transmission of Trypanosoma evansi, M. B. MITZMAIN (*Pub. Health Serv. U. S., Hyg. Lab. Bul. 94 (1914), pp. 7–39, pls. 5*).—This collection consists of the following articles: (1) The Relation of *Tabanus striatus* to Surra Dissemination (pp. 7–19), previously noted (E. S. R., 30, p. 253); (2) The Relation of Mosquitoes to Surra (pp. 20–23); (3) Notes on the Bionomics of *Lyperosia exigua* and the Relation of this Fly to Experimental Trypanosomiasis (pp. 24–30); (4) Mechanical Transmission Experiments with *Philæmatomyia crassirostris* (pp. 31, 32); (5) Experiments with *Hippobosca maculata* in the Transmission of Surra (pp. 33, 34); (6) Experiments with Bloodsucking Gnats (p. 35); and (7) The Rôle of *Musca domestica* in Surra Conveyance (pp. 36–39).

A new staining method for preparing granulated tubercle bacilli, T. ISHIWARA (*Centbl. Bakt. [etc.], 1. Abt., Orig., 68 (1913), No. 1, pp. 113–117*).—The following method is recommended for this purpose:

(a) Stain for 2 minutes with a petroleum ether water-fuchsin solution prepared by filling the conical portion of a test tube with petroleum ether, adding sufficient distilled water to fill three-fourths of the tube, filtering through moistened filter paper, and add one-fourth of the volume of carbol-fuchsin solution (100 cc. of 5 per cent carbolic acid and 10 cc. of a saturated solution of fuchsin); (b) decolorize for 2 minutes in a 25 per cent solution of nitric acid and follow by rinsing with 70 per cent alcohol until the preparation appears colorless; (c) stain with a saturated aqueous solution of methylene blue. After staining wash well with water to prevent a precipitation of the coloring matter.

The modified Gram staining method was also simplified by utilizing a petroleum ether water-carbol-gentian violet solution. In addition to this a simplified method for staining the Much granules and the granular form of the tubercle bacillus is described.

About the occurrence of tubercle bacilli in apparently healthy mammary gland tissues of cows destined for slaughter, T. ISHIWARA (*Centbl. Bakt. [etc.], 1. Abt., Orig., 70 (1913), No. 1–2, pp. 1–10*).—Mammary glands macroscopically free from tubercular changes but from cows having organs affected with tuberculosis were found in 5 out of 26 cases to contain tubercle bacilli. Most of the udders came from animals which had the severest form of the disease.

Study of the pathological changes which occur in the organs of tubercular pigs and the detection of granulated tubercle bacilli, T. ISHIWARA (*Berlin. Tierärztl. Wchnschr., 29 (1913), No. 37, pp. 657, 658*).—In this work the organs of 217 pigs were examined for the presence of tubercle bacilli. The lungs were tubercular in 181 instances, the bronchial lymph glands in 173, the mesenteric lymph nodes in 147, the spleen in 132, the tracheal nodes in 126, the liver in

83, the shoulder glands in 82, the kidneys in 55, the kneefold nodes in 21, the bones in 12, the joints in 8, and the muscles in 2 cases. A table is given which shows the pathologic appearance of the various organs.

In a previous paper the author pointed out that the tubercle bacilli present in hog tuberculosis are very hard to detect, as stainable forms are only sparingly present. The presence of much fat in and about the organisms is not the cause for not detecting the stain. Using Much's method it was found that as a rule the granulated bacilli from the purulent and calcified areas are harder to detect than the organisms present in the compact nodules and caseated areas.

Contribution to the biology of the tubercle bacillus, I, G. LOCKEMANN (*Deut. Med. Wchnschr., 39 (1913), No. 50, pp. 2458, 2459*).—Weighing the cultures of the tubercle bacillus from time to time is considered a good procedure for obtaining a clew to the state of the growing process. Tubercle bacilli cultures, after having reached their maximum of growth, lose weight, undoubtedly because of an autolytic process going on in the culture. There was no difference in the rate of growth when different culture media (glycerin bouillon, or asparagin solution) were used. However, the acid titer obtained with the two cultures was different, and the curve with the glycerin bouillon took a middle position between the titers set down for the human and bovine types of organism.

During the growth of the tubercle bacillus in asparagin solutions, i. e., protein-free media, substances were liberated which gave reactions characteristic of the proteins.

Serologic investigations of the antigen content of the cultures of tubercle bacilli, B. MÖLLERS (*Deut. Med. Wchnschr., 39 (1913), No. 50, pp. 2460, 2461*).—The antigens noted by the complement fixation method in cultures of tubercle bacilli increased up to the sixth week of growth. A diminution of antigen took place at the eighth week.

Theobald Smith's reaction curve as an aid for differentiating human and bovine tubercle bacilli, J. WANKEL (*Deut. Med. Wchnschr., 39 (1913), No. 50, p. 2461*).—The value of this method (E. S. R., 17, p. 294) for diagnosing the kind of culture in hand was investigated with 45 cultures. With 25 cultures of the human type only 11 gave a characteristic Smith curve, and 6 formed no acid at all but otherwise behaved like bovine bacilli. Out of 20 cultures which were adjudged by the animal experiments to be of the bovine type, 15 behaved as bovine cultures with the reaction curve, 4 formed acid which, according to Smith would be classed with the human type, and the remaining culture could not be classified.

See also a previous note by Grund (E. S. R., 26, p. 582).

Intraperitoneal lysis of tubercle bacilli, W. H. MANWARING and J. BRONFENBRENNER (*Jour. Expt. Med., 18 (1913), No. 6, pp. 601–617, figs. 4; abs. in Science, n. ser., 38 (1913), No. 978, pp. 453, 454; Proc. Soc. Expt. Biol. and Med., 10 (1913), No. 3, pp. 67, 68*).—"If suspensions of tubercle bacilli are injected into the peritoneal cavities of tuberculous guinea pigs, there takes place a rapid disappearance of the bacilli from the peritoneal fluids, as determined by subsequent examinations by the Ziehl-Neelsen method. Nine-tenths of the bacilli may disappear within an hour, and all but an occasional bacillus within five hours. This disappearance is paralleled by the appearance of atypical, nonstaining, and granular forms. After the disappearance numerous granules can be demonstrated in the peritoneal fluids and peritoneal scrapings by the Much method.

"Before the conclusion can be drawn, however, that the disappearance of the tubercle bacilli is due wholly to their destruction by the peritoneal fluids,

such factors as a possible removal of the bacilli by the rapid formation and absorption of peritoneal transudate must be ruled out, as well as the possibility of a spontaneous metamorphosis of the bacilli into nonstaining and therefore invisible forms, as described by Much. A similar rapid disappearance is brought about in the peritoneal cavities of tuberculous rats, rabbits, and dogs. The mechanism of the disappearance is now under investigation."

Does the subcutaneous injection of antiphymatol (Klimmer) protect bovines against artificial and natural infections with bovine tubercle bacilli? A. EBER (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 14 (1913), No. 4–5, pp. 203–230*).—Antiphymatol is a preparation made from tubercle bacilli which has been passed through cold-blooded animals to render them avirulent (E. S. R., 20, p. 480). The injection of a trade package (5 cc.) of the vaccine into guinea pigs produced no tuberculosis.

The results reported considered 16 bovines, 9 of which were treated and 7 which were kept as controls, and the experiments were made especially for the purpose of determining whether the subcutaneous injection of antiphymatol will in reality protect against an artificial or natural infection with the bovine type of tubercle bacilli. It was also decided to note whether the protection given lasted for any length of time.

Six animals vaccinated 3, 6, or 8 months before intravenous or subcutaneous infection passed through the cycle of the disease at the same rate as unvaccinated animals. Three vaccinated animals exposed to natural infection became tubercular as quickly as the control animals. All animals infected by the artificial method were treated with the same culture.

The prevention of human tuberculosis of bovine origin (particularly from the point of view of the Tuberculosis Order, 1913), W. G. SAVAGE (*Vet. Jour., 69 (1913), No. 461, pp. 513–521*).—This is a discussion of the occurrence of tuberculosis among bovines, with special reference to its being a source of danger to man. The whole discussion is in the light of the English Tuberculosis Order of 1913.

"In the words of the covering circular of the board, the order 'aims at securing the destruction of every cow found to be suffering from tuberculosis of the udder, or to be giving tuberculous milk, as well as of all bovine animals which are suffering from tuberculosis with emaciation.' . . .

"It is clear that the prevention of human tuberculosis of bovine origin can not be separated from the prevention of tuberculosis among bovine animals, and that no steps can be permanently satisfactory unless they definitely aim at a diminution of the total bulk of bovine tuberculosis."

Notes on some parasites of live stock in the West Indies, P. T. SAUNDERS (*West Indian Bul., 14 (1914), No. 2, pp. 132–138*).—A general account of the more important parasites.

The granular venereal disease and abortion in cattle, W. L. WILLIAMS (*U. S. Dept. Agr. Bul. 106 (1914), pp. 57*).—During the course of the investigations here reported post-mortem observations were made on the killing floors of abattoirs at some of the principal slaughtering centers, including Chicago, Omaha, Kansas City, Denver, and Fort Worth, with a view to determining how widely and extensively the granular venereal disease exists among cattle in this country. Records of 3,250 cases of granular venereal disease, here summarized in tabular form, show nodules or granules macroscopically visible in the vulvar mucosa of 2,806.

Records kept for a period covering 22 years of a dairy herd consisting of a total of 217 cows with a total of 645 pregnancies, the details of which are here presented in tabular form, show an average annual rate of 12 per cent of abortions. Records kept from May, 1909, to December, 1911, of another herd in

which there were a total of 1,206 pregnancies show 17 per cent to have been the annual rate of abortions.

The investigations have led the author to the following general conclusions: "Abortion in cattle is essentially always the result of a chronic infection within the utero-chorionic space, revealing itself post-mortem by the presence of the so-called abortion exudate, which contains generally, if not always, the abortion bacilli. The granular venereal disease of cattle is, so far as known, universally distributed. From clinical observation it has a vital relation to contagious abortion. It is incurable in the present state of our knowledge, but may be greatly decreased in virulence. Contagious abortion of cattle has attained an essentially universal distribution, frequently present merely as an unrecognized infection of the genital organs, not inducing actual abortion but causing premature birth, retained afterbirth, and sterility.

"The ordinary if not sole avenue of the entrance of the infection of contagious abortion is the genital canal, and the invasion antedates the sealing of the uterus, which ordinarily occurs within 30 days after conception. When conception has occurred and the cervical canal has been sealed, the fate of the fetus is settled. If a sufficiently virulent and voluminous infection exists in the utero-chorionic space, abortion may result; if such infection does not exist within the sealed utero-chorionic space when the formation of the seal is completed, it will not enter thereafter during pregnancy.

"In the present state of our knowledge little or nothing can be done to prevent abortion once the pregnant uterus is sealed and the infection of contagious abortion exists within the hermetically sealed cavity. By systematic disinfection of the genitalia immediately following abortion or premature birth, and also in retained afterbirth and kindred infections of the uterus, the affected animals may be largely guarded against future sterility and abortion. It is even more important that the vaginæ of heifers, whether virgin or previously bred, and cows shall be systematically disinfected for a period before and after breeding, until conception is assured. It is equally important that the genital organs of breeding bulls be kept clean by regular disinfection, including washing immediately prior to and after service. Most important of all, breeders of valuable cattle should institute definite, energetic, and permanent efforts to guard new-born calves simultaneously against the three great dairy scourges—calf scours and pneumonia, abortion and sterility, and tuberculosis."

The curative treatment of hemorrhagic septicemia in cattle by the administration of iodin, J. D. E. Holmes (*Vet. Jour., 70 (1914), No. 468, pp. 277–280*).—Of a large number of drugs tested in the laboratory, iodin was the only one found to have any action on the course of this disease. When administered either by mouth or subcutaneously as late as 16 hours after the inoculation of the virus, about one-half of the cases so treated recovered. At 16 hours after inoculation susceptible animals generally show a rise in temperature, uneasiness, and loss of appetite, and death follows in from 24 to 36 hours after inoculation.

"In laboratory experiments when an animal inoculated with hemorrhagic septicemia shows a decided rise of temperature or other symptoms of disturbance he rarely survives, unless he has received antiserum treatment. In many of the cases treated with iodin the animals passed through a fairly severe attack of the disease and recovered. In other cases which ended fatally death was delayed by one to two days."

Warble flies, a danger with imported cattle, C. P. Lounsbury (*Agr. Jour. Union So. Africa, 8 (1914), No. 1, pp. 61–64, fig. 1*).—The author calls attention to the fact that since warble flies do not occur in South Africa it is of considerable importance that the maggots in imported cattle be destroyed.

Ascaris suum in sheep, D. C. MOTE (*Science, n. ser., 40 (1914), No. 1023, p. 216*).—During the course of a post-mortem examination of an 8-month-old lamb two female ascarids were found which were identified as *A. ovis*. This lamb had been fed and kept in a pen previously occupied by hogs known to be infested by ascarids, and the author thinks it probable that the ascarids may represent *A. suum*, since it is still questionable whether *A. ovis* is a distinct species.

A summary of studies of loco weed disease of sheep, H. T. MARSHALL (*Bul. Johns Hopkins Hosp., 25 (1914), No. 282, pp. 234–236*).—This is a brief review of a detailed report to be published later of the results of investigations conducted in Montana for this Department during the summers of 1903 and 1904. Some 80 sheep were used in feeding experiments with *Aragallus spicatus*.

The experiments have led the author to conclude that none of the abnormalities encountered in the sheep could be attributed to the poisonous action of the loco weed. He states that none of the sheep gave the slightest evidence of having suffered any ill effects from eating the weed. On the other hand, the experiments seemed to confirm the view that the animals were suffering chiefly from starvation combined with one type or more of parasitic infection.

"My investigations have convinced me that there are several diseases of western live stock masquerading under the general name 'loco disease.' One hundred per cent of the severely 'locoed' sheep which I studied were not suffering from locoism, but from underfeeding combined with parasitic infection. I therefore think there is reason to be doubtful as to the existence of pure, bona fide loco weed poisoning, and I hold that it is perfectly certain that the heavy losses attributed to loco weed disease are at least in large measure due to other causes, which can usually be ascertained by careful study."

The prevention of hog cholera in Indiana, C. G. STARR (*Indiana Sta. Circ. 44 (1914), pp. 7, figs. 2*).—The data here presented relate largely to antihog cholera serum and its use.

Canine babesiasis in Porto Rico, I. GONZALEZ MARTINEZ (*Jour. Trop. Med. and Hyg. [London], 17 (1914), No. 13, p. 194*).—During the course of routine examination of dogs for epizootic diseases and for hydrophobia the author detected two cases of canine piroplasmosis in Porto Rico.

Hygiene and diseases of poultry, LIÉNAUX (*Min. Agr. et Trav. Pub. [Belgium], Off. Rural Raps. et Communs., No. 9 (1914), pp. 245–266*).—A general account.

Studies on fowl cholera.—IV, The reciprocal relations of virulent and avirulent cultures in active immunization, P. B. HADLEY (*Rhode Island Sta. Bul. 159 (1914), pp. 383–403*).—"The present paper presents the results of a study conducted to ascertain (1) the protective power of certain avirulent cultures of the fowl cholera organism against a highly virulent culture (culture 48); (2) the extent and degree of protective power exercised by a certain immunizing culture (culture 52) against twelve, heretofore untested, virulent strains; (3) the protective power of combinations of cultures. The results, briefly stated, are as follows:

"Among 17 strains of the actual fowl cholera bacterium which have now been tested for their resistance-producing power toward a highly virulent culture, only one (culture 52) was found which produced any resistance whatever; and this culture, upon subcutaneous inoculation, invariably gave perfect immunity against the most virulent culture in the laboratory collection (culture 48). This immunizing culture has now been tested (alone) against five other virulent strains, toward three of which it is also protective. In the other two cases, it is irregularly protective. In the two instances in which culture 52 alone failed to protect, or protected irregularly, complete protection was

afforded by inoculation with culture 52, followed after one week, or more, by inoculation with culture 48. In all cases in which culture 52 alone was not tested against virulent cultures (seven) the inoculation with both cultures 52 and 48 in the sequence and under the conditions stated, yielded complete immunity.

"The results obtained in the investigation, thus far reported, are such as to afford, for the first time, complete control over infection in rabbits with probably any virulent strain of the fowl cholera bacterium. The method thus found successful for the active immunization of rabbits will now be employed, perhaps with modifications, in an attempt to produce a corresponding active immunity in birds."

See also previous work (E. S. R., 31, p. 485.)

Spirochetosis of fowls, S. von Rátz (*Berlin. Tierärztl. Wchnschr., 30 (1914), No. 7, pp. 117–119*).—The author has demonstrated the occurrence in Hungary of a spirochetosis of poultry, which affects chickens, geese, and ducks. He finds that the spirochetes may remain alive in the blood during a period of from 36 to 48 hours after death, during which time they are virulent.

A disease of the wattles of fowls, H. R. Seddon (*Jour. Dept. Agr. Victoria, 12 (1914), No. 7, pp. 426–428, figs. 2*).—A so-called wattle disease investigated by the author at the Melbourne University Veterinary School appears to be a localized form of fowl cholera in which the causal microbe gains entrance into the wattles and remains there, giving rise to two very marked symptoms, namely, (1) enlargement, due to the presence of inflammatory fluid, and later (2) distortion, with the formation of hard nodules of cheesy material in the wattle.

RURAL ENGINEERING.

Irrigation, F. L. Bixby (*New Mexico Sta. Rpt. 1913, pp. 41–47*).—Brief descriptions of the calibration of a submerged orifice, measurements of water on the mesa plats, a study of end contractions in Cippoletti weirs, duty of water investigations in orchard irrigation, and irrigation of onions and tomatoes are given.

In the duty of water investigations in orchards it was found that in comparing the flooding method by checks and the furrow method the different amounts of water produced very little difference in the material growth of the tree. The 4-in. irrigation appeared to be the best amount to use. In connection with the furrow irrigation it was impracticable to irrigate with large streams of water.

Loss of water in irrigation systems, P. M. Fogg (*Engin. and Contract., 41 (1914), No. 25, pp. 720–724*).—Considerable data gathered by the Irrigation Investigations of this Office and by the U. S. Reclamation Service on evaporation losses, field evaporation, percolation losses, methods of loss prevention, waste water, etc., are reviewed and discussed.

Irrigation by "zaaidams." C. J. v. Zyl (*Agr. Jour. Union So. Africa, 7 (1914), No. 4, pp. 493–495*).—A method by which moisture is conserved in the soil by the construction of walls of earth, or ordinary earthen embankments, in which flood water is impounded and allowed to soak thoroughly into the soil is described.

Gate structures for irrigation canals, F. C. Scobey (*U. S. Dept. Agr. Bul. 115 (1914), pp. 61, pls. 12, figs. 18*).—This bulletin describes and illustrates a large number of designs of small and medium-sized gate structures adapted to many localities for controlling the flow of water in ditches and canal systems. These include headgates and floodgates to regulate the water entering the system from the source of supply, check gates to regulate the water while within the

canal, sand and waste gates to control the water which is to be turned out and wasted, branch canal lateral and delivery gates to regulate the water turned out to branches of the system or to users, and bifurcation works and division gates to regulate the flow of water in the main canal and that passing into branches or laterals.

The author does not attempt to treat the subject fully, but gives examples of structures which are said to serve the purpose for which they are intended better than many others in common use. Since local conditions control many features of gate structures the descriptions given relate to existing structures in actual use which it is believed will prove suggestive and can be readily adapted to other conditions by local engineers and ditch owners.

The drainage of irrigated land, J. P. MARAIS (*Agr. Jour. Union So. Africa, 7 (1914), No. 3, pp. 353–356*).—The author briefly relates the results of his experience in the drainage of irrigated land, particularly referring to methods of removing injurious alkali salts.

Drainage and reclamation of swamp and overflowed lands, C. KETTLEBOROUGH (*Ind. Bur. Leg. Inform. Bul. 2 (1914), pp. 68*).—It is the purpose of this pamphlet to present briefly the evolution, progress, and present status of drainage and drainage legislation in Indiana; to enumerate and discuss the most significant results achieved in other States; to point out the inadequacy of the present system in the State, the magnitude and economic importance of the question, and to suggest plans to bring the drainage laws of the State into harmony with those of the other States and thus promote the rapid and permanent reclamation of nonarable swamp lands.

Drainage investigations on the northeast Missouri prairie, M. F. MILLER, C. B. HUTCHISON, T. R. DOUGLASS, and R. R. HUDELSON (*Missouri Sta. Bul. 118 (1914), pp. 445–497, figs. 5*).—Tile drainage experiments to determine the actual economic gain in crop yields and to determine the relation of underdrainage to fertilization are reported, together with a summary of data secured from farmers who have had experience with tile drainage.

It is concluded in general that for the wet sloughs and sags found in the region the use of tile is a very paying proposition. "On the tight level prairie where the water passes to the tile more slowly it is necessary to lay the tile from 4 to 6 rods apart for satisfactory work, thus greatly increasing the cost. . . . However, where the land is very level and where the tile are properly put in, the tiling of this land will pay. On the prairie land that drains well naturally . . . while tiling may pay, this will depend upon the crops grown and the particular character of the land in question. The return in such cases is therefore doubtful."

The fertilizer experiments indicated that when large supplies of available fertilizers are added there is less need for tiling and the profit from it is reduced. Drainage without any fertilizer treatment gave a total increase per acre on all crops for six years after laying the tile of $26.55, or within $1.33 of the cost of tiling. As an investment it seems profitable to apply manure and rock phosphate on this soil, even more profitable to use bone meal and turn under an occasional crop of cowpeas, while lime returns a good percentage on the investment where the land is not drained. Upon tiling, the plant food in the soil becomes more available and the detrimental effects of the acid are removed, so that the only profitable soil treatment seems to be the use of a legume green manure crop to supply nitrogen and organic matter which are decidedly lacking."

In addition to general suggestions as to the laying of tile it is further concluded not to be advisable to use a smaller size of tile than 4-in. in any case, and in systems draining more than 30 acres an 8-in. main is usually more

satisfactory. As regards distance apart of laterals it is concluded that 6 rods is about the maximum width for the level prairie. The proper depth on the prairie seems to be around 2½ to 2¾ ft. on the average, although the actual depth varies from 2 to 3½ ft.

Drainage problems in the Ganges delta, C. ADDAMS-WILLIAMS (*Calcutta, 1913, pp. 35, pls. 19*).—This book comprises a series of six lectures in which it is proposed to illustrate the practical application of mathematical principles in the design of the drainage works for delta lands. The discussion is confined to actual problems encountered by the author in the Ganges delta near Calcutta. The formation of the Ganges delta and the reclamation in the tidal portions of the delta are discussed in some detail, followed by a discussion of the practical design of the necessary drainage works. Maps and detailed drawings of drainage works and specific structures are included.

Some interesting experiments in hydraulics (*Dom. Engin., 68 (1914), No. 2, p. 33, figs. 2*).—Experimental data are given in tabular form showing the actual quantity of water which blbbs of sizes from ¼ in. to 1½ in. will discharge.

A proportional-flow weir, E. W. RETTGER (*Engin. News, 71 (1914), No. 26, pp. 1409, 1410, figs. 2*).—By means of mathematical analysis the author points out that a weir whose width at any point is inversely proportional to the square root of the height of that point above the crest will have a theoretical discharge exactly proportional to the head. By means of further mathematical analysis he outlines a process for slightly modifying the theoretical shape of such a weir so that the coefficient of discharge will be constant for different heads.

Modern pumping machinery, R. W. ALLEN (*Sci. Amer. Sup., 78 (1914), No. 2009, pp. 8–11, figs. 10*).—The author deals chiefly with the mechanism of pumping outfits as used for the drainage of the fens in England, which employ vertical steam and horizontal oil engines driving horizontal spindle centrifugal pumps. The description is confined to outfits representing some of the more recent works in the district. Diagrammatic and other illustrations of important features are given.

Some tests on pipe reinforcing (*Cement Era, 12 (1914), No. 7, pp. 44, 45, figs. 8*).—Tests are reported on 6-in. sections of concrete pipe 22 in. in diameter and 2.2 in. thick, reinforced with 2 circular bands of No. 7 bright wire placed 3 in. apart on centers, thus bringing them 1½ in. from the outside edges. Each band consisted of an inner and outer hoop, the inner hoop being placed ⅝ in. from the inner wall and the outer ½ in. from the outer wall. The two hoops were fastened together by (1) 6 radial ties, (2) 12 radial ties, (3) 6 radial ties and 6 tangential ties, and (4) 6 radial ties and ties in truss form.

The average load at failure of four unreinforced specimens was 328 lbs. The respective average loads at first crack for four specimens with each type of reinforcing were 465, 577, 835, and 1,047 lbs.; and at failure 1,413, 1,490, 1,645, and 1,770 lbs., thus showing the truss tied reinforcing to be much the strongest type.

The use of paint films as protective coatings for concrete, E. E. WARE and S. M. SCHOTT (*Concrete-Cement Age, 4 (1914), No. 4, pp. 177–181, figs. 5*).—This paper discusses the basic principles of successfully coating concrete surfaces and reports investigations on the relative merits of various concrete coating materials. The materials were applied to the surfaces of concrete and stucco panels and given an exposure test extending over about two years. To indicate the leaching out of lime, one-half the surface of each panel was painted after one year's exposure with a green paint, the pigment in which was a mixture of chrome yellow and Prussian blue. Conclusions from the test are as follows:

"Assuming water to be an important agent in the disintegration of concrete and stucco, there is a necessity for a system of waterproofing that will prevent

absorption. . . . No coating compound can be successful that will disintegrate under the influence of the weather. . . . Although linoxyn is readily saponifiable in the cold, there is not, under ordinary conditions, enough lime carried out by the small amount of water that may penetrate a paint film in good condition, to cause disintegration of the film. . . . The absence of stains on the green test paint film in the cases of some of the panels, the coats of which showed disintegration at the time of application of the green, would indicate that the lime at the surface of the panels had become pretty well carbonated within the first year. Any stucco exposed to the weather for a year's time can be coated satisfactorily with a good outside paint. A successful concrete coating material should be compounded on the same basis as is used for a satisfactory outside paint for wood, with only such adjustments in composition as tend to make it more nearly impervious, and these must not be made at the expense of the elasticity and general durability of the film."

An analysis of worn out and ravelled macadam surfaces with suggestions as to treatment, E. A. STEVENS (*Engin. and Contract., 42 (1914), No. 1, pp. 14, 15*).—The author points out that ravelling of macadam surfaces is due to (1) improper construction, (2) overload, or (3) neglect. Reconstruction of defective sections is the remedy suggested for the first cause of raveling, resurfacing with a better type of surface for the second, and repair of the old surface for the third. It is pointed out in this connection that a road structure may be so maintained as to increase its carrying capacity greatly, thus making the problem largely one of economics and administration.

The prevention of the subcrust movement in roads, E. S. SINNOTT (*Surveyor, 46 (1914), No. 1172, pp. 9–11, figs. 7*).—A means for preventing the lateral and longitudinal movement of material forming the subcrust of highways under heavy traffic is described and illustrated. The essential feature is that longitudinal and cross members are placed at a suitable depth below the surface to preclude any movement of the subcrust and at the same time to provide a means of constructing an impervious arch of tarred macadam to carry the traffic. It is thought best to construct the frames of reinforced concrete.

Carburation in theory and practice, R. W. A. BREWER (*New York, 1913, pp. VIII+253, figs. 70*).—It is the purpose of this book to provide in convenient form information upon the properties of various fuels, what treatment these fuels require for use in an engine, and what has been done in the past in order to obtain the necessary data upon which to base the theory. Chapter 1 gives a general outline of the subject, explaining terms used, describing early carburetting devices, and discussing the general principles of carburation and modern requirements. The succeeding chapters deal with the following subjects: Vaporization and evaporation; limits of combustion—air and heat required; inlet pipes and inertia; the flow of fuel through small orifices; the annulus; Brewer's fuel orifice; special jets; moving parts; float chambers; petrol substitutes; exhaust gas analyses; and carburettors. The closing chapters consist of descriptions of some of the best-known carburettors with criticisms thereon. Appendixes give tabular data as to equivalents, conversion from degrees Baumé to specific gravity, and properties of gases.

Simple water testing, P. EDELMAN (*Chicago, 1913, pp. 50, figs. 20*).—This pamphlet outlines quick, cheap, and practical methods of analyzing boiler feed-water, and for regulating the ill effects of impurities.

Steam plowing experiments in the Aira estate, Kheri, United Provinces, B. C. BURT (*Agr. Jour. India, 9 (1914), No. 1, pp. 1–6, pls. 2*).—Plowing experiments on heavy grass land with an alluvial soil very sandy in places, using a single-cylinder oil-burning steam tractor of about 25 brake horsepower, dragging two sets of 3-disk plows, and cutting furrows 10 in. wide and about

8 in. deep, showed that for this class of work the single-cylinder tractor was hardly powerful enough as even on the best land it was imposible to plow at top speed. It is stated that the cost of plowing per acre will vary enormously with the land to be plowed, and the amount to be charged for interest and depreciation will always be a matter of opinion, but that the cost of plowing virgin land is reasonable and much less than that of hand digging.

Buildings for small holdings in England and Wales (*Bd. Agr. and Fisheries [London], Rpt. on Buildings for Small Holdings, 1913, pp. 122, pls. 37*).—This report describes and discusses what are considered to be the most suitable buildings and equipment for small farms from the English viewpoint. The main points considered are the small holder's house, farm buildings, unusual materials and methods of construction, building by-laws, and the rural laborer's cottage. Appendixes to the main report deal with such subjects as particulars of houses, farm buildings and fencing erected in connection with small holdings, the increase in rent per acre attributable to the cost of erecting farm buildings of brick and timber, and the creosoting of timber.

It is concluded that as regards the cost of equipment generally some saving may be effected if houses and farm buildings are erected either in pairs or groups within a limited area, thus allowing reductions (1) in the quantity of necessary materials and (2) in the cost of supervision; by standardizing fittings; and by the provision of common roads and water supply. Other more specific conclusions are given regarding the design and materials of construction of houses and farm buildings and health regulations. A number of detail plans of buildings and equipment accompany the report.

Silo building, W. D. NICHOLLS (*Kentucky Sta. Ext. Circ. 18 (1914), pp. 24, figs. 8*).—This circular gives general information regarding silos and silage and the construction of stave and concrete silos.

How to build a Gurler silo, P. M. BRANDT (*Missouri Sta. Circ. 67 (1914), pp. 247–257, figs. 10*).—This circular is mainly a reprint of a previous one on the same subject (E. S. R., 25, p. 891).

Mississippi poultry house, D. SCOATES (*Mississippi Sta. Circ., 1914, Mar., pp. 8, figs. 7*).—The poultry house is described and diagrammatically illustrated. The essential features are as follows: (1) It has an open front, (2) is raised 2 ft. off the ground, (3) it can be opened on all sides, and (4) it is inexpensive. This poultry house "is designed especially for the Mississippi farmer, . . . should not cost over $35, and where lumber can be bought very cheap, and the work done by farm hands at leisure times, it can be put up much cheaper."

Sheep-dipping tanks, B. G. L. ENSLIN (*Agr. Jour. Union So. Africa, 7 (1914), No. 3, pp. 360–371, figs. 11*).—In this article are given detailed plans, specifications, and descriptive and other information for the construction of an improved design for a circular sheep-dipping tank. The circular tank is recommended in preference to any other form because of its cheapness of construction, economy in the consumption of dipping material, and the better results obtained with less labor in dipping operations because the sheep can be kept swimming the full period of its immersion. The tank is supplied with a receiving yard, forcing pen, entrance race, inslide, outslope, dripping pens, and a drying yard. The maximum diameter is 6 ft., which decreases toward the bottom, and the approximate capacity is 505 gal. The tank itself and the outslope are built of bricks laid in ordinary blue hydraulic lime mortar with the inside plastered with cement mortar.

Sewage disposal for country homes, H. W. RILEY (*Cornell Reading Courses, 3 (1914), No. 59, pp. 149–187, figs. 27*).—The purpose of this pamphlet "is to suggest to persons in country homes better methods of disposing of household wastes than by means of the slop-pail and the outdoor privy." Although in-

tended to be of popular interest, the treatment is such as make it also of considerable technical value. Sanitation, particularly with regard to water supplies, is the main feature of the introduction, and is kept in mind throughout the entire discussion. Different sections describe and discuss types of sewage disposal systems; the septic tank and its proper design; the tile purifying system, its design, location, and construction; and types of septic tank systems, including the sink and barrel septic tank; sink, direct closet and barrel, or concrete, septic tanks; direct closet and chemical tank; and the type Y and metal septic tanks.

The most important of these appears to be the Y septic tank, which is a single-chamber, continuous-discharge tank of standard depth and variable length and width. The tank is of concrete, and inclined baffle boards are placed before the inlet and outlet, with a vertical bottom baffle near the outlet. New features of the purification system are the so-called sewage switch and sewage divider. The switch is designed to divert the sewage from one section of the system to another, and the divider to effect thorough distribution.

The L. R. S. sanitary privy (E. S. R., 25, p. 891), and the Kentucky sanitary privy are also described.

A number of illustrations accompany the text.

Sanitary sewage disposal without sewers (*Mo. Bul. Ind. Bd. Health, 17 (1914), No. 4, pp. 42, 43, figs. 2*).—A recent development in septic tanks for residential sewage disposal, which is composed mainly of Imhoff features, is described and diagrammatically illustrated.

Screening as an antimalarial measure. H. R. CARTER (*Pub. Health Rpts. [U. S.], Reprint 183 (1914), pp. 12*).—This paper discusses some of the more important points regarding the use of screens in houses and mosquito bars for beds.

RURAL ECONOMICS.

The business of farming, W. C. SMITH (*Cincinnati, Ohio, 1914, pp. 292, pls. 39*).—The author believes that for farming to be successful the soil should be plowed deep and thoroughly prepared, the best quality and variety of seed and live stock should be used, crop rotation should be followed in such a way that the soil should be supplied with an ample amount of plant food, all by-products should be utilized in a business-like way, the best machinery should be purchased and properly handled, the housewife should know how to prepare properly the right kind of foods to make the farmer and his family efficient in their work, the farmer should keep sufficient accounts or records to be able to determine whether any part of his business pays, and that he should be given sufficient credit to carry on his farm operations to the greatest advantage.

Some suggestions for city persons who desire to farm, G. F. WARREN (*New York Cornell Sta. Circ. 24 (1914), pp. 29–40*).—This circular was prepared for inexperienced persons making farm investments. It points out that farming is a complicated business, requires considerable experience for success, and while for one who knows how to farm it offers a wholesome living and a modest profit, it requires a considerable amount of capital, the returns from some investments do not even come in the farmer's lifetime, and aside from increases in land values it very rarely results in even small fortunes. The fact that food and housing are cheaper on the farm makes it more attractive for persons with a large family.

The way suggested to begin farming is to raise crops, as if one can not make a profit at this he has no need for buildings. The beginner should follow the practices of the best farmers of the region. The way for the young man to

prepare for farming is by working as a hired man on a farm, and unless the mature man can earn good farm wages for some one else he is not ready to direct a farm himself.

Social life in the country, MARY W. KEYES (*Home Prog., 5 (1914), No. 10, pp. 472–475*).—The author suggests that to improve the social life of the farm woman, every woman should know how to harness and drive a horse and should have one at her disposal. Among other means suggested are the use of the school house or church parlor, both of which should be supplied with a cooking stove. Entertainment should be encouraged in the form of good music, amateur plays, and the serious study of some elevating topic.

Report of the Pennsylvania Rural Progress Association, 1914 (*Rpt. Penn. Rural Prog. Assoc., 1914, pp. 24, figs. 11*).—The purpose of this association is to promote a wider study and consideration of the relation of rural problems to the welfare of the State. This report describes various means that have been used toward this end, and gives the constitution of the association and the programs of various country life conferences in which it took a part.

Scottish Agricultural Organization Society (*Scot. Agr. Organ. Soc. Rpt. 1913, pp. 161*).—This report contains a statement of the year's work, a list of the leaflets issued by the society, outlines of meetings held, and accounts and reports of affiliated societies.

An analysis of rural banking conditions in Illinois, C. L. STEWART ([*Champaign, Ill.*], *1914, pp. 38, figs. 11*).—By means of a questionnaire sent to rural bankers and to county institute officials the Illinois Bankers Association undertook to determine the "ability with which and the conditions under which Illinois farmers secure personal and mortgage credit and to define the relation between banks and farmers within the State."

The returns indicate that the farmers comprise 75 per cent of the customers and 45 per cent of the stockholders and own 40 per cent of the stock. The average rate paid the farmer depositors was 3 to 4 per cent. Sixty-three per cent of the loans were to farmers, and it was maintained that they receive as good or better treatment than any other class. The average rate of interest on long-term loans was 6.27 and on short-term loans 6.68 per cent. The usual period for short-term loans was 6 months. Of the farms mortgaged, it is estimated that the mortgages were for 48 per cent of their value.

The bankers also reported that 75 per cent of the tenants were satisfactory persons to whom to loan money. They were opposed to loaning money for more than from 10 to 20 years, and favored the Torrens system of land title.

The purpose of the law concerning long and short time credit in France, B. NOGARO (*Rev. Econ. Internat., 11 (1914), II, No. 3, pp. 438–459*).—This article discusses the organization of credit in France and its weak points, the function of the large banking companies, renewal of local banks, and establishment of district banks. It calls attention to the scarcity of people's banks in towns in contrast with their frequency in rural districts and the recent proposals for utilizing the 20,000,000 francs of the Bank of France to aid the development of the people's banks in towns. It also discusses the new laws that have been proposed concerning banks and banking combinations.

The shifting of labor in agriculture, S. SCHULTZ (*Neue Zeit, 32 (1913), 1, Nos. 11–12, pp. 411–417; 12–19, pp. 447–456*).—Prior to 1890 the number of shifting laborers in Germany was so small as to attract but little attention. In 1890 about 17,000 came from the surrounding countries, but in 1910–11 there were 696,000, of which 388,000 were employed in agriculture. The larger part of them came from Russia and Austria. The author also discusses the influence of this element in the international labor market and the necessity for it where agriculture is extensive rather than intensive.

Lure of the land (*Missouri Red Book, 1913, pt. 1, pp. VII+613, pls. 181, figs. 6*).—This volume sets forth the resources, advantages, and opportunities along the line of agriculture, manufacturing, and mining in the State of Missouri. Various phases of the agricultural industries of the State are fully described and illustrated.

A practical treatise on the agriculture of northern Africa, C. Rivière and H. Lecq (*Traité Pratique D'Agriculture pour le Nord de L'Afrique. Paris, 1914, pp. III+1090, figs. 31*).—This report contains detailed information concerning climate, soil, agricultural machinery, forage plants, cereals, industrial crops, live stock, diseases of plants and animals, colonization, and legislation concerning agriculture.

The agriculture of Belgian Kongo (*Min. Colon. Belg., Rap. Agr. Congo Belge, 1911–12, pp. 548, pls. 3, figs. 269*).—This annual report describes the organization and administration of the work for the advancement of agriculture, and methods that are being employed to improve the native crops and farm animals, and to introduce new plants and pure-bred live stock. A large part of the report is devoted to conditions in Katanga. The report is fully illustrated.

The agricultural outlook (*U. S. Dept. Agr., Farmers' Bul. 604 (1914), pp. 24*).—This report contains a general review of crop conditions on June 1, 1914, and gives statistical tables showing the acreage conditions, estimated production, and prices for wheat, oats, and barley, and the condition and prices of many other farm crops and products. The condition of the principal crops was found to be about 2.2 per cent above the average of the last ten years.

The outlook for the 1914 foreign wheat crops was found to be fully normal except in a few countries. The proportion of the world's wheat crops harvested each month was estimated as follows: January 5, February 1, March 3, April 7, May 4, June 15, July 35, August 25, September 2, October and November practically none, and December 3 per cent.

The prices of farm products during May indicated that the increase this year was less than the average increase during the last five years. The condition of cotton on May 25 was estimated as 74.3 per cent of normal, as compared with 80.4 as the average for the last ten years.

The quantities of apples shipped by rail and water during the past season amounted to only 64 per cent of the shipments for the previous year. The greatest falling off was in the North Central States west of the Mississippi River.

The agricultural outlook (*U. S. Dept. Agr., Farmers' Bul. 611 (1914), pp. 39, figs. 2*).—The composite condition of all crops of the United States on July 1, 1914, was about 1.4 per cent above the 10-year average condition on that date, indicating conditions about 8.7 per cent better than the outturn of crops last year. The forecast for the domestic wheat crop is 930,000,000 bushels, or the largest ever produced, but the condition of the foreign wheat crop indicates a considerable deficiency.

Statistical data are included showing for cotton and tobacco the acreage and condition on July 1, and for sugar beets the area planted in 1913–14 and area harvested in 1913. The condition of practically all farm crops, the prices paid to producers of agricultural products on June 15, and the range of prices of agricultural products at market centers are shown by statistical tables.

In addition, C. J. Brand discusses marketing by parcel post (pp. 16–22) and reports as to trial shipments of several commodities. He concludes that there are many conditions and circumstances under which the use of parcel post for marketing will not prove economical, but that there are many others, especially for particular products and under particular conditions, for which parcel post

transportation would seem the only reasonable and economical method. "It is not expected that parcel post marketing will supplant usual methods, but its proper use should certainly make it a valuable supplement to these under all conditions and a check upon other methods when they are not being applied with fairness either to the producer or the consumer, or to both."

G. C. White discusses the car supply in relation to the marketing of the wheat crop in 1914 (pp. 23–26). One of the greatest drawbacks has been failure to load and unload promptly and too frequent reconsigning of shipments. Indications are that shippers and carriers are cooperating this year more closely than ever before in their efforts to avert a car shortage in the movement of the wheat crop.

A popular article by F. M. Webster on the Hessian fly (pp. 12–16) is also included.

Prices and supplies of corn, live stock, and other agricultural produce in England and Wales (*Bd. Agr. and Fisheries [London], Agr. Statis., 48 (1913), No. 3, pp. 187–277, figs. 3*).—This annual report contains statistical data showing for 1913 the prices of agricultural products when sold off of farms and at certain markets and the quantity entering various markets by months. Comparative data for the average annual prices are given for earlier years. The trade in live stock between Great Britain and Ireland is shown for 1876–1913.

Agricultural statistics of Germany (*Statis. Jahrb. Deut. Reich. 35 (1914), pp. 37–58*).—This yearbook gives statistical data showing for 1895–1907 the number of farms by sizes, and the total area devoted to different agricultural purposes for each size; the area, production, and average yield of the principal farm crops for 1903–1913; the number and value of live stock for 1873–1912; and the number of live stock slaughtered from 1905–1913.

[Agricultural] statistics of New Zealand, 1912 (*Statis. New Zeal., 1912, vol. 2, pp. 489–545*).—This annual report contains statistical data concerning land settlement, the number of agricultural holdings by sizes, land tenure, the number of live stock, and the areas devoted to different agricultural purposes.

International statistics relating to agriculture (*Statis. Jahrb. Deut. Reich. 35 (1914), pp. 18*–27**).—This section contains statistical data showing the number of persons employed in agriculture; total land area; area devoted to agriculture and forestry; area, production, and average yield of wheat, rye, barley, and potatoes; number of live stock; prices of agricultural products at the principal markets; and production of sugar, cotton, silk, and cocoa in the more important countries.

International statistics of agriculture (*Ann. Statis. [France], 32 (1912), pp. 185*–193**).—This section contains statistical tables showing the area and production of wheat, oats, potatoes, and vineyards for 1850–1913, and the number of live stock for 1835–1910.

AGRICULTURAL EDUCATION.

The training of agricultural chemists and the organization of agricultural chemical institutions, O. LEMMERMANN (*Landw. Vers. Stat., 83 (1913), No. 3–4, pp. 317–335*).—Among the reasons discussed by the author for the lack of adequately trained officials for experiment stations and related institutions are the need of a special training course, but more particularly the unsatisfactory remuneration, conditions of tenure, and future prospects of such positions. A suggested course of study is outlined, together with examinations for chemists training for the position of agricultural chemist in agricultural experiment stations, control stations, and related institutions. The training of agriculturists

desiring to become agricultural chemists in experiment stations and problems of station organization are also discussed, the author recommending that all control work be separated from the experiment station.

Popular agricultural instruction and its methods, P. DE VUYST (*Vie Agr. et Rurale, 3 (1914), No. 24, pp. 656–658*).—The author discusses the object of the popularization of agricultural science, general and professional agricultural instruction and the influence of the former, and methods of popularizing agricultural instruction.

A plan for the introduction of the teaching of elementary agriculture (*Trenton, N. J.: Dept. Pub. Instr., 1914, 2. ed. rev., pp. 19*).—This is a revised edition of the bulletin previously noted (E. S. R., 28, p. 598). Suggestions for rating the agricultural work of schools adopting this plan, estimating credits, and examinations in elementary agriculture have been added.

School and home exercises in elementary agriculture, B. M. DAVIS (*Columbus, Ohio, 1914, pp. 96, figs. 12*).—This loose-leaf manual is an extension and revision of a series of exercises on The Soil and its Relation to Plants, previously noted (E. S. R., 19, p. 390), and is intended as a supplement to a text-book. Each exercise consists of an explanation and directions for carrying out a project or problem by the pupil, together with a brief statement of familiar facts and practices which the observed results help to explain, and a list of references to literature on the subject.

Suggestions for teaching household arts and agriculture (*Atlanta, Ga.: Dept. Ed., 1913, pp. 67, figs. 29*).—Directions are given for making a hotbed and children's home gardens, corn club work, housekeeping and sanitation in the rural school, and suggestions as to where, what, why, and how cooking should be taught in rural schools, serving, canning and preserving, sewing, darning, patching, and manual training.

A plan for the development of home economics along the line of practical education, CORNELIA PALMER (*Timely Helps for Farmers [Col. Agr. Univ. Me.], 7 (1914), No. 10, pp. 77–84; Rural Educator, 4 (1914), No. 3, pp. 54–56*).—A general scheme of home economics education from kindergarten to university is suggested as well as some of the possibilities of home economics training in schools.

Field crop production, G. LIVINGSTON (*New York, 1914, pp. XIX+424, figs. 135*).—This book is intended for use in agricultural schools and in elementary courses in colleges, but in no sense as a complete or exhaustive treatise on the subject such as would be desired for regular college courses in field crops. It describes the various field crops, discusses their history, types, uses, production, cultural methods, diseases and insect enemies, etc., and includes a chapter each on crop rotation and on the marketing of grain. A brief list of references, a list of the agricultural experiment stations in this country, a table showing the composition of field crops, and review questions are appended.

Corn growing (*N. J. Dept. Pub. Instr., El. Agr. Leaflet 3, rev. (1914), pp. 23*).—This is a revised edition of the leaflet previously noted (E. S. R., 28, p. 598), in which many additions, including references to books and bulletins, suggestions to teachers, etc., have been made.

Papers set at the examinations in horticulture, 1893 to 1913 (*London: Roy. Hort. Soc., 1913, pp. 33*).—This publication contains lists of the examination questions for the years 1893–1913, inclusive, for the general, school teachers', and public parks examinations in horticulture.

The beginner's garden book, A. FRENCH (*New York, 1914, pp. VIII+402, figs. 211*).—This text-book for the use of upper grammar grades with beginners in gardening is arranged in four sections, namely, autumn work, winter work,

gardening under glass, and the real garden, thus completing the garden cycle. Each chapter is followed by review questions and each section by general review questions. A planting list and table, directions for the draining of a garden and for trenching, and a table of the length of life and the space values of vegetable seeds are appended.

Project study outlines for vegetable growing (*Bul. Bd. Ed. Mass., No. 9 (1913), pp. 127*).—This bulletin consists of project study outlines, incorporating questions and references prepared by agricultural instructors, for producing and disposing of 16 of the more common vegetables.

Trees and forests (*N. J. Dept. Pub. Instr., El. Agr. Leaflet 9 (1913), pp. 15, pls. 4*).—A discussion of the relations of instruction in forestry to other school subjects is followed by an article on trees and forests, the object of which is to show the relation of tree life to human life and something of the methods of physiology and arboriculture. It contains many suggestions for the guidance of teachers and pupils.

Collection and preservation of insects and other material for use in the study of agriculture, C. H. Lane and N. Banks (*U. S. Dept. Agr., Farmers' Bul. 606 (1914), pp. 18, figs. 15*).—This publication was prepared for use by teachers in rural schools, and suggests methods of collecting, preparing, mounting, and preserving insect specimens and similar illustrative materials.

A dairy laboratory guide, H. E. Ross (*New York, 1914, pp. VI+84*).—"This manual is designed as a guide to students in dairy laboratory work, with just enough explanation given to supplement the exercises which are outlined in the manual. It is not intended for a text-book and should not be used in the place of one."

Bench and tools for the farm mechanics shop, E. L. Usry (*Rural Educator, 3 (1914), No. 4, pp. 68, 69, 67*).—In this article the author shows how a shop or work room may be equipped satisfactorily for a moderate sum. Directions for making a 5-ft. bench, material for which would not exceed $2.50, are given; also a list of tools based on a 6-bench outfit which can be obtained for not to exceed $70.

Simple lessons in nature study, J. O'Neill (*London, Glasgow, Bombay, pp. X+11–122, figs. 82*).—The author outlines simple lessons in plant and bird life for the assistance of teachers.

The study of flowers in the first grade, Ida V. Flowers (*Atlantic Ed. Jour., 9 (1914), No. 10, pp. 19–23, fig. 1*).—A working plan for a series of three lessons dealing with one flower—the dandelion—is presented.

Tree study in the first grade, Ida V. Flowers (*Atlantic Ed. Jour., 9 (1913), Nos. 2, pp. 70, 71; 3, pp. 116, 117; 9 (1914), No. 6, pp. 212–215*).—This series of suggestive lessons for use in the fall, winter, and spring is intended to teach some of the values of trees, to increase and train observation and as an attractive center for the study of seasonal changes.

For Arbor Day and Bird Day (*Atlantic Ed. Jour., 9 (1914), No. 7, pp. 250–259, figs. 2*).—This collection of timely material and suggestions for the observation of Arbor and Bird Days includes The Significance of Arbor Day, by A. S. Draper; Suggestions to Teachers and Some Common Birds, by K. C. Davis; Wild Flowers, by R. E. Wagner; suggested program for Arbor Day; suggestions for the observation of Bird Day, by the Illinois Audubon Society; and poems.

Preparing normal students to teach children about birds, G. H. Trafton (*Nature-Study Rev., 10 (1914), No. 3, pp. 84–93*).—The work with birds at the Mankato (Minn.) State Normal School, which may be divided into laboratory work, field trips, and class discussions, is outlined as well as the bird study,

extending through the eight grammar grades, carried out in the training schools.

The nests of some common birds, R. E. WAGER (*Nature-Study Rev., 10 (1914), No. 4, pp. 137–151, figs. 11*).—This is a study of the nests and eggs of some of the more common birds.

Some insect studies, ALICE J. PATTERSON (*Nature-Study Rev., 10 (1914), No. 3, pp. 108–113*).—The author describes a study of insects taken up in the fall in a nature study course in the Illinois State Normal University.

Industrial and commercial geography, J. R. SMITH (*New York, 1913, pp. XI+914, pls. 2, figs. 242*).—The author has divided his book into two parts, the first treating geography from the point of view of specific industries and the second from the point of view of commerce. Under the first part he has chapters on the place and nature of agriculture; the cereals; starchy foods; animal industry; the vegetable, fruit, and wine industries; sugar; and condiments and tobacco.

Making practical use of the decimal point, K. L. HATCH (*Rural Educator, 3 (1914), No. 6, pp. 119, 118*).—A home project with resulting problems in the keeping of feed and production records of dairy herds by school children is described to illustrate the practical use of the decimal point.

Corn arithmetic, C. W. STONE (*Atlantic Ed. Jour., 9 (1913), Nos. 1, pp. 7, 8; 2, pp. 53, 54; 3, pp. 87, 88, 90; 4, pp. 148, 149; 10 (1914), Nos. 5, pp. 180–183, figs. 3; 6, pp. 207–210, figs. 2; 7, pp. 260–262, figs. 2*).—It is the purpose of these articles to offer suggestions to teachers for vitalizing the teaching of arithmetic, agriculture, composition, and country life manual training in the upper grammar and lower high school grades. Problems in arithmetic are used to help decide whether it pays to select and care for seed corn properly, how much difference the variety may make in the corn crop, to help determine the importance of crop rotation in corn raising, the relative value of various means of maintaining the fertility of the soil, the waste of harvesting corn—advantages of the silo, how well it pays to test seed corn, and the possibilities of corn breeding.

The agricultural demonstration field, G. A. BRICKER (*Rural Educator, 3 (1914), No. 4, pp. 65, 66, figs. 2*).—The practical phases of planning and making school demonstration fields using one-eightieth of an acre as a unit are discussed. In the author's opinion it makes little difference from the educational standpoint whether a school or a home demonstration field is used; but where feasible the school field is to be recommended.

School gardens, P. ESSER (In *Handbuch der naturgeschichtlichen Technik, Leipsic and Berlin, 1914, pp. 319–339*).—This article, in the Handbook of the Technique of the Natural Sciences issued by Prof. Bastian Schmid, discusses the selection of a site, cultivation, planting, care, etc., of school gardens in general, the central propagating garden, the community school garden, and the individual school garden in particular.

School agriculture exhibit, C. E. WYLIE (*Agr. Student, 20 (1914), No. 8, pp. 601, 602*).—The author offers suggestions for the preparation of exhibits which include work of all classes above the second grade.

Boys' and girls' contests and clubs (*Agr. Ed. [Kans. Agr. Col.], 6 (1914), No. 3, pp. 30, figs. 10*).—Suggestions and rules are given for conducting contests along various lines for boys and girls, as well as directions for organizing agricultural, manual training, high school demonstration (for poultry raising, dairying, growing tomatoes and corn, and potato seed selection), and rural life clubs.

Suggestions on organizing boys' and girls' clubs, Z. M. SMITH (*Purdue Univ. Dept. Agr. Ext. Leaflet 47 (1914), pp. 4*).

Rules and regulations for the corn clubs and potato clubs for boys and canning clubs and poultry clubs for girls, 1914 (*Ky. Dept. Agr., Labor and Statis. Bul. 15, pp. 11*).—Rules and regulations for club work among the boys and girls of the common schools are given.

Boys' pig clubs, C. S. JONES (*Alabama Col. Sta. Circ. 21 (1913), pp. 4*).—This circular outlines the purpose of the boys' pig club and gives directions for joining it, rules governing it, and the basis for determining the winners in club contests.

Corn club catechism with introductory stories, W. H. BARTON (*Clemson Agr. Col. Bul., 1 (1914), No. 1, pp. 24*).—The object of this bulletin is to teach children the fundamental principles of soil building and production. It includes accounts of the legume family, corn, etc., told in story form for children, followed by corn club resolutions for South Carolina and a catechism for corn club members.

Suggestive programs for canning clubs, SUSIE V. POWELL (*Prog. Farmer, 29 (1914), No. 17, p. 536, fig. 1*).—Eight programs for local canning clubs are outlined.

MISCELLANEOUS.

Annual Report of Florida Station, 1913 (*Florida Sta. Rpt. 1913, pp. CXXXI+XII, figs. 21*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1913, a list of the publications of the year, a general review of the work of the station during the year, and departmental reports, the experimental features of which are for the most part abstracted elsewhere in this issue.

Twenty-fourth Annual Report of New Mexico Station, 1913 (*New Mexico Sta. Rpt. 1913, pp. 58, figs. 2*).—This contains the organization list, a report of the director on the work, publications, and exchanges of the station, including reports of heads of departments, the experimental features of which have been for the most part previously noted or are abstracted elsewhere in this issue, and a financial statement for the fiscal year ended June 30, 1913.

NOTES.

Arizona University.—Rufus B. von Kleinsmid, since 1909 professor of education and psychology at DePauw University, has been appointed president. The registration in the college of agriculture is 30 per cent larger than that of the previous year.

California University and Station.—Elaborate tests of various kinds of sorghums and corn for silage purposes are contemplated by the animal husbandry department.

Dr. Walter P. Kelley of the Hawaii Federal Station has been appointed professor of agricultural chemistry in the Graduate School of Tropical Agriculture and the citrus substation. Woodbridge Metcalf has been appointed assistant professor of forestry. R. F. Miller, formerly assistant animal husbandman at the Montana Station, has been appointed assistant professor of animal husbandry to have charge of the experimental work with sheep, and with headquarters at Davis. Dr. M. B. Kurtz has been appointed assistant veterinarian in connection with the hog-cholera immunization work.

Hawaii Federal Station.—Dr. E. V. Wilcox, special agent in charge since 1908, has returned to this Office as scientific and administrative assistant in connection with its relations with the experiment stations. J. M. Westgate, agronomist in Forage-Crop Investigations of this Department, has been appointed agronomist in charge to take effect January 1, 1915.

Idaho University and Station.—W. L. Carlyle resigned as dean and director in September and is now secretary of the Northwestern Live Stock Association, with offices in Moscow, Idaho. J. S. Jones, vice director of the station, is serving as acting director. O. D. Center, of North Dakota, has been appointed director of agricultural extension, with offices in Boise, and began his duties in October. Stephen A. Regan has resigned as state seed commissioner to accept a position with the grain standardization work of this Department and will be stationed at Portland, Oreg. R. B. Coglan, state leader of county agents, has resigned to engage in teaching in Oregon. E. M. Strate began work in October as creameryman for the department of dairying.

Illinois University and Station.—W. F. Handschin has been appointed state leader in charge of county advisory work, both under the Smith-Lever Act and in cooperative relations with this Department, with the title of vice director of demonstration work. Other appointments include the following instructors: Clyde R. Newell, farm mechanics; James B. Andrews, animal husbandman; Frederick N. Evans, landscape gardening; and Margaret B. Stanton, Mamie Bunch (extension), Greta Gray, and Anna Williams, household science. Assistants have also been appointed as follows: Claude Harper and James W. Whisenand, animal husbandry; Anton Prasil, animal chemistry; Mary H. Keith, animal nutrition; P. W. Allen, dairy bacteriology; William B. Nevens and Frank Turner, dairy husbandry; Howard D. Brown, olericulture; Edwin Deal, Herbert W. Blaney, and John R. Van Kleek, landscape extension; D. T. Englis, floricultural chemistry; August G. Hecht and L. E. Miles, floriculture; Roy Hansen,

nitrogen fixation research; and Edward F. Torgerson and Henry DeWerff, soil physics.

Iowa College.—C. E. Brashear, assistant in animal husbandry at the Missouri University and Station, has been appointed assistant to the dean of the college of agriculture.

Kansas College and Station.—A bequest of $20,000 in memory of Davies Wilson, who took a prominent part in the location of the college at Manhattan, has recently become available through the death of the donor, Mrs. Wilson. The money may be used either for the erection of a building bearing his name or for the establishment of a permanent endowment "for the promotion of education in the arts and sciences."

Over 100 inmates of the Federal penitentiary at Leavenworth and the state penitentiary at Lansing are enrolled in the correspondence courses of the college.

Recent appointments include the following: Miss Margaret H. Haggart, formerly of the New Mexico College, as professor of domestic science; E. N. Wentworth, of the *Breeders' Gazette*, as assistant professor of animal breeding and assistant in nutrition investigations; Mrs. Rebecca Bartholomew and Miss Nellie McClurg, assistants in domestic science; Miss Marion P. Broughten, assistant in movable schools in home economics; Alfred L. Clapp, superintendent, agronomy farm; P. L. Gainey, of the Missouri University and Station, assistant in bacteriology in the station; Miss Marian Harrison and Miss Florence Hunt, assistants in domestic art; William P. Hayes, assistant in zoology; Miss Stella Mather, assistant in home economics in farmers' institutes; Frank E. Mixa, assistant in poultry husbandry; R. E. Wiseman, assistant in farm machinery; E. M. Tiffany, correspondence assistant in extension; Miss Olive Sheets, instructor in domestic art; Miss Addie Root and Miss Louise Caldwell, assistants in farmers' institutes; and Ross M. Sherwood, assistant professor of poultry husbandry at the Iowa College, extension lecturer in poultry work.

Kentucky University and Station.—S. C. Jones, assistant professor of soil physics and assistant agronomist, resigned November 15 to become assistant in soils in the Indiana Station, and has been succeeded by P. E. Karraker, research assistant in soil physics at the Michigan Station.

Maine University.—Alexander W. Lurie (Cornell, 1914) has been appointed instructor in horticulture.

Massachusetts College.—A steam-operated wax-rendering apparatus has been installed for the service of beekeepers. A nominal charge of 5 cents per pound of rendered product is made, and considerable interest is being manifested in the undertaking.

Missouri University and Station.—The stock-judging pavilion provided by the last legislature is now in use. The outside dimensions are 90 by 160 feet, with an arena 50 by 120 feet, and a seating capacity of 1,500. It is also equipped with offices, practicum rooms, locker rooms, and shower baths, and will be utilized for short-course gymnasium work. It is said to be the best lighted pavilion of its kind in this country and cost about $25,000.

The enrollment in the summer school of agriculture exceeded 200, or double that of the previous year. Many of the students were teachers desirous of qualifying under the Wilson law, which went into effect in September and provides state aid to high schools maintaining agricultural courses given by teachers of approved preparation. The enrollment in the four-year winter course of the college of agriculture is 535 and that of the first term of the two-year winter course in agriculture 199.

The department of agronomy has been divided into departments of soils and farm crops with M. F. Miller in charge of the soils work and C. B. Hutchison in charge of that of farm crops.

An agricultural-extension service was established July 1 under the direction of A. J. Meyer, formerly assistant to the dean and director and superintendent of short courses. The organization in the extension service includes L. F. Childers, in soils and farm crops; S. T. Simpson, in animal husbandry; D. H. Doane, state leader of farm advisers; May C. McDonald, in home economics; R. H. Emberson, boys' and girls' clubs; E. R. Spence, hog cholera eradication; and R. S. Besse, assistant to the state leader.

Farm advisers have now been located in 13 counties and branch short courses were held at 11 towns last year. Other lines which are to receive special attention are the hog cholera eradication campaign, dairy development, poultry extension, and movable schools of home economics. About 1,200 members are enrolled in boys' and girls' clubs.

Recent resignations include the following: H. H. Laude as farm adviser to Marion County, O. C. Smith as assistant in agricultural chemistry, T. J. Talbert as assistant in entomology, and W. I. Watkins as assistant in the soil survey. Appointments have been made including Frederick Dunlap as forester in the station, P. M. Brandt, formerly assistant professor of dairy husbandry, as assistant to the dean and director and superintendent of short courses, and the following assistants: H. C. Heaton, in veterinary science, vice Talmadge T. Tucker resigned to take up further studies in the New York State Veterinary College of Cornell University; C. E. Neff (1914), in farm crops; W. E. Thrun and B. E. Sive, in agricultural chemistry; H. K. Thatcher, in the soil survey; F. L. Bentley, in animal husbandry; A. H. Hollinger, in entomology; and C. E. Mangels, in agricultural chemistry in the station. Paul V. Maris has been appointed farm adviser for Saline County; I. F. Gilmore, farm adviser for Marion County; and R. M. Green, cooperative field agent in the project known as the demonstrations of the business of farming, which is being conducted in cooperation with the Bureau of Plant Industry of this Department.

Nebraska University and Station.—Robert F. Howard, assistant professor of horticulture and assistant horticulturist in the Wisconsin University and Station, has been appointed professor of horticulture and horticulturist and has entered upon his duties.

New Hampshire College.—J. B. Abbott, associate in soil improvement in the Indiana Station, has been appointed state leader of the county agents.

Rutgers College.—Director J. G. Lipman of the station has been appointed dean of agriculture.

Cornell University.—Prizes have recently been offered by James A. D. S. Findlay, of Salisbury Mills, for the best discussions by students of the college of agriculture of some phase of drainage improvement.

O. W. Dynes, associate professor of agronomy and connected with the plant-breeding work of the North Dakota College and Station, has been appointed instructor in farm crops. Earl L. Overholser has been appointed instructor in pomology. Recent promotions include the following: As professors, M. F. Barrus, plant pathology; L. J. Cross, agricultural chemistry; O. A. Johannsen, biologist; C. H. Myers, plant breeding; and as assistant professors, A. L. Thompson, farm management; Royal Gilkey, extension teaching; C. T. Gregory, L. R. Hesler, I. C. Jagger, and M. H. Rankin, plant pathology; E. W. Benjamin, poultry; A. J. Eames, botany; J. K. Wilson, soil technology; E. E. Barker, plant breeding; E. M. Tuttle, rural education; and Robert Matheson, economic entomologist.

Ohio State University.—J. E. McClintock for the past four years agricultural editor of the International Correspondence Schools, has been appointed supervisor of publications of the extension service of the college of agriculture and

entered upon his duties September 1. Other appointments include the following: V. C. Smith, secretary of the college, vice H. C. Ramsower, head of the newly organized department of agricultural engineering; John I. Falconer, Ph. D. (Wisconsin, 1914), assistant professor of rural economics; C. L. Long, extension department in horticulture and poultry husbandry; J. S. Coffey, of Purdue University, assistant professor in animal husbandry; T. C. Stone (Illinois, 1914), assistant in animal husbandry; J. L. Hutchison and F. J. Salter, instructors in agricultural chemistry; and G. M. McClure, assistant in agricultural chemistry. Max F. Abell (Cornell, 1914) has been appointed assistant in farm crops.

Oregon College.—The horticultural show, in which apples of standard varieties from many parts of the United States were exhibited, was held in the horticultural building November 7. Fruits of the kinds best adapted to Oregon conditions were displayed in educational forms, and contests in judging and identification of varieties were features of the show. An exhibit of Oregon nuts was made by a nursery company, and former students of the college provided three subtropical exhibits of fruits and nuts from southern California and Florida. Demonstration potting and pruning were also done by the specialists.

Farmers' Week has been postponed to February 1–6, 1915, inclusive, and the exercises assigned to the extension division. A number of conventions of the leading agricultural and rural interests will be held at that time, and problems of rural community life will receive consideration.

Pennsylvania College and Station.—The new stock judging pavilion is practically completed. It is a concrete, brick, and steel structure with an arena 120 feet long by 30 feet wide and with seating accommodations for about 800. The basement also contains rooms for instruction in methods of butchering and handling meats, and a modern refrigeration plant is to be installed. The cost of the pavilion and equipment is about $30,000.

The new dairy barn consists of a center or main feed barn, 100 feet long by 36 feet wide, for the storage of hay and grain, to which are attached a cattle barn 129 feet long by 14 feet wide, and an experimental cattle barn 80 by 36 feet. There are also two silos 18 feet in diameter and 40 feet high, and a series of sheds, 168 feet in length, for bulls, young stock, etc. The barns are constructed of hollow brick on a concrete foundation, the walls finished in stucco, and roofed with red asbestos shingles. Their total cost with equipment is about $125,000.

Miss Pearl MacDonald has been appointed home economics worker in connection with the extension department; H. N. Cobb and L. J. Obold, both 1914 graduates of the college, assistants in agronomy; F. D. Crooks, assistant in animal husbandry, vice D. E. Warner, resigned to accept a position with the Connecticut Storrs Station; M. F. Grimes, assistant in animal husbandry, vice C. W. Hickman, resigned to become assistant professor of animal husbandry at the University of Idaho; James M. Sherman, instructor in bacteriology at the college and bacteriologist at the station; T. L. Hills, assistant in bacteriology; and W. C. Gillespie (1914), assistant in experimental pomology, vice R. H. Bell, resigned.

Texas College and Station.—J. D. Blackwell, a 1914 graduate of the University of Missouri, has been appointed associate professor of agricultural education, and W. T. Magee, instructor in animal husbandry.

I. S. York, superintendent of the Spur substation, has resigned, and was succeeded by R. E. Dickson, formerly assistant agronomist of the main station, June 1. Thomas J. Conway (Cornell, 1914) has been appointed poultry husbandman, and entered upon his duties October 1. J. M. Jones, instructor in animal husbandry and animal husbandman in the New Hampshire College and

Station, has been appointed animal husbandman in charge of breeding investigations beginning August 1, and is conducting experimets with sheep. William Levin and J. B. Rather have resigned as assistant chemists, and the former has been succeeded by J. W. Chewning, and he in turn by R. H. Ridgell.

Virginia College and Station.—Glancy Sherman Ralston, research assistant in horticulture at the Oregon Station, has been appointed assistant in the extension department of the college. Dr. M. T. Smulyan, a graduate of the Massachusetts College, has accepted a research position in entomology.

Washington College.—F. L. Pickett, Ph. D., research fellow in botany in Indiana University, has been appointed associate professor in plant physiology. R. J. Barnett has been made professor of pomology.

West Virginia University.—The enrollment in the college of agriculture is 100 per cent greater than that of last year.

Wisconsin University and Station.—Of the 1914 graduates of the college of agriculture, R. V. Gunn has been appointed assistant in farm management, George B. Mortimer instructor in agronomy, and J. C. Walker assistant in plant pathology. W. A. Schoenfeld has resigned as executive secretary to become specialist in farm accounting in the department of extension of the University of Texas.

American Association for the Advancement of Agricultural Teaching.—The fifth annual meeting of this association was held in Washington, D. C., November 10.

A report of the standing committee on the use of land in connection with agricultural teaching, prepared by this Office, indicated that distinct problems are presented in different sections. In the New England States the majority of the pupils are living at home and have easy access to the school; the school farms are small and the home project is more or less closely supervised, so that the need of the school farm is less felt. In the Northern and Central States the school farms are small, but the pupils are drawn from greater distances than those in the New England States and have not access to as good means of transportation. There are also a larger number of boys from towns and cities and of girls desiring to become teachers in the classes studying agriculture.

In the South the majority of the schools have a boarding department and a large farm, so that the agricultural pupils have a better opportunity to participate in farm operations, and home projects have not been developed. Even in these schools, where the pupils carry on the farm operations under the direct supervision of the instructor, it is claimed too much attention has sometimes been given to getting the farm work done and not enough to making the pupils efficient in the ordinary farm operations. The report indicated that all schools having farms, however, can aid the more readily in the distribution of pure-bred seed, the introduction of new varieties of plants, fruits, and shrubs, and the extending of the services of pure-bred animals in the community.

The standing committee on cooperative use of equipment and illustrative material reported that little progress has been made in the preparation and use of such material during the past year. This Department is the only agency at the present time producing motion-picture films for agricultural instruction. It is urged that colleges provide prints or miniature drawings of all available charts for the purpose of cooperative exchange. The motion picture is not regarded as psychologically adapted to purposes of instruction, while, on the other hand, lantern slides and charts are not so attractive and do serve as valuable aids in the work of effective instruction.

K. L. Hatch, in a paper on What Constitutes Suitable Extension Work for Secondary Schools, advocated that the teacher of agriculture in the secondary

school before attempting other extension work should make a survey of agricultural conditions, organize extension efforts around home projects of his pupils, give individual assistance to farmers, and provide for rural organization. The extension service of the high schools should not be in the beginning an announced function, but rather a process of evolution.

How to Improve the Quality of Teaching the Technical Subjects in Agricultural Colleges was the subject of a paper read by A. V. Storm. He believed that administrative officers must be brought to realize how necessary is professional preparation along pedagogical lines for those who are to teach in colleges of agriculture. Courses of study should be so arranged that the student who expects to teach will obtain a broad preparation, including the fundamental sciences. Large classes must be made smaller, as by employing more teachers, abandoning some of the highly differentiated advanced courses which enroll only a small number of students, or reducing the number of courses offered by omitting nonessentials or duplicated material.

A better sequence of courses would, he believed, improve the quality of teaching. Poor organization of subject matter must be overcome, the examination must be made a part of the educative process, the students' judgment of the quality of the teaching of certain courses must be given consideration, and the teaching force must make greater use of the experiment station and extension results.

In a paper by A. B. Graham, entitled The Relation Between the State Department of Education and the Agricultural College in the Supervision of Secondary Agriculture, the present system of vesting the administrative work in the hands of the state department was indorsed, the college of agriculture being regarded as the source of information.

The officers elected for the ensuing year are A. V. Storm, University of Minnesota, president; W. H. French, Michigan Agricultural College, vice president, and A. C. Monahan, United States Bureau of Education, secretary.

Agricultural Education in Prince Edward Island.—The increased appropriation under the Agricultural Instruction Act (E. S. R., 29, p. 198) has enabled the government to make progress in organizing a complete system of agricultural education correlated with the general system. Provision has been made for short courses in household science in Prince of Wales College, long and short courses in agriculture, practical instruction in agriculture for those qualifying for teachers of the public schools, a science course for teachers now in charge of schools, and women's institutes. A very successful 2-weeks school for teachers was held during the summer vacation at the Prince of Wales College attended by nearly half the teachers of the Province.

Agricultural Education and Research in Greece.—The *Daily Consular and Trade Reports* announce that the Greek Government has established eight agricultural experiment stations, which are under the control of the ministry of agriculture, one of these being near Athens; an agricultural school known as Cassavetios at Halmyrios, with three professors and about 35 pupils; and two model farms, one at Astros and the other at Trichonis.

Agricultural Instruction in Mauritius.—Arrangements have been made for the training of a limited number, not to exceed six, of young men in agricultural science with special reference to the sugar industry in the laboratories of the department of agriculture. They must agree to pursue for three years a course of study in the general principles of agriculture, agricultural botany and biology, agricultural chemistry, agricultural entomology, and meteorology. A diploma will be awarded and a research scholarship will be available once in every three years.

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EXPERIMENT STATION RECORD.

VOL. XXXI. ABSTRACT NUMBER. NO. 9.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Ammonia-soluble inorganic soil colloids, G. S. FRAPS (*Texas Sta. Bul. 165 (1914), pp. 3–8*).—It is pointed out that the indirect methods do not really estimate the colloidal constituents of soils but only compare them with regard to certain properties which may be partly dependent on other soil constituents. "The only method as yet proposed for approximately estimating the total colloids is by staining the colloidal particles, and estimating their number or quantity by means of a microscopic examination."

The work reported in this bulletin deals with the soluble colloidal soil substances and not with the total, or insoluble, colloids. The method used is based on observations made in the laboratory of the Texas Station, that when ammonium carbonate is added to the clear ammoniacal filtrate obtained in digesting soils with ammonium hydroxid a precipitate consisting chiefly of inorganic material is obtained. "The use of ammonium carbonate for precipitating the clay is the method proposed by Rather [E. S. R., 25, p. 614] for purifying the ammoniacal humus filtrate." The method is as follows:

"Digest 100 gm. of the soil with 2,000 cc. of fifth-normal hydrochloric acid at room temperature for 24 hours. Filter and wash thoroughly. Wash back into the bottle with 2,000 cc. of 4 per cent ammonia and let digest at room temperature for 24 hours, shaking every half hour for 4 hours. Filter on a large folded filter, getting as much of the soil as possible on the filter, and continue to pour back the filtrate until it comes through clear, as per the Smith method. Discard the residue. Take 1,500 cc. of the filtrate, coagulate with the ammonium carbonate (and heat, if necessary), let settle, collect on ash-free filter, ignite, and weigh.

"Fuse the precipitate with sodium and potassium carbonate, dissolve in hydrochloric acid, and evaporate to render silica insoluble. Filter off and weigh silica, if pure; if contaminated with iron, purify. Precipitate the iron and alumina in the filtrate with ammonia, ignite, and weigh precipitate. Fuse with potassium acid sulphate, and dissolve, reduce the iron with zinc, and titrate with permanganate."

If the soil contains much lime several extractions must be made with the hydrochloric acid or with stronger hydrochloric acid for the purpose of removing it.

The soils to be examined are divided into four groups, arranged according to their total content of ammonia-soluble colloids, viz, "(1) 0 to 0.05 per cent; (2) 0.051 to 0.101 per cent; (3) 0.101 to 0.2 per cent; (4) 0.201 to 0.6

per cent. For the purposes of comparison, the total nitrogen, the acid-soluble iron and alumina, and the acid-soluble lime, are also given." "The maximum quantity present in the soils examined was 0.59 per cent. The average of seven soils rich in colloidal matter was 0.299 per cent inorganic colloidal material."

The average percentage composition of the inorganic colloids of the four groups was as follows: Silica 59.7, 53.3, 51.5, and 47.5 per cent; iron oxid 24.3, 12.6, 11, and 12.6 per cent; alumina 8.7, 16.9, 29.9, and 36.9 per cent; and difference 7.3, 17.2, 7.6, and 3 per cent, respectively. "The most striking fact about these averages is the decrease in percentage of silica, and the increase in percentage of alumina, as the soluble colloid content of the soil increases."

The molecular ratio of the constituents is: "0 to 0.05 per cent colloids—$12SiO_2 : 2Fe_2O_3 : Al_2O_3$; 0.051 to 0.1 per cent colloids—$11SiO_2 : 2Fe_2O_3 : 2Al_2O_3$; 0.101 to 0.2 per cent colloids—$12SiO_2 : F_2O_3 : 4Al_2O_3$; 0.201 to 0.6 per cent colloids—$10SiO_2 : Fe_2O_3 : 4Al_2O_3$."

"In kaolin the ratio of silica to alumina is $2SiO_2 : Al_2O_3 : 2H_2O$. If we assume that all the alumina is present as kaolin, then there is an excess of five-sixths of the silica in the first group, seven-elevenths in the second group, one-third of the silica in the third group, and one-fifth of the silica in the fourth group. However, there were other bases present in the precipitate which were not estimated. It appears probable that the soluble colloidal material [extracted by ammonia] consists of hydrated silica, hydrated oxids of iron, hydrated silicates of alumina with other bases, and possibly hydrated silicate of alumina."

Bordeaux mixture.—I, Physico-chemical studies, O. BUTLER (*New Hampshire Sta. Tech. Bul. 8 (1914), pp. 125–180, pls. 2, figs. 3; Phytopathology, 4 (1914), No. 3, pp. 125–180, pls. 2, figs. 3*).—There is apparently a marked divergence of opinion regarding the composition of Bordeaux mixture, and according to the literature it is clear that no agreement exists as regards the chemical and physical properties (especially the latter). In consequence its toxic and biological properties are also imperfectly understood. This paper deals with the chemistry and physics of Bordeaux mixture.

"Bordeaux mixture may be composed of one or several basic cupric sulphates or mixtures of basic cupric sulphates depending on the ratio of cupric sulphate to calcic oxid employed. The copper precipitate of Bordeaux mixtures in which the ratio of cupric sulphate to calcic oxid is 1 : 1 or 1 : 0.5 becomes crystalline on standing when the washes contain more than 0.125 per cent cupric sulphate. The rate at which the copper precipitate becomes crystalline depends on the temperature and concentration in cupric sulphate of the mixtures. The crystallization of Bordeaux mixtures 1 : 1 and 1 : 0.5 is retarded by the presence of such impurities as ferrous sulphate, calcic carbonate, magnesic oxid, and magnesic carbonate; but this retardation is not due to the diluent action of the salts in question.

"The crystallization of Bordeaux mixtures 1 : 1 and 1 : 0.5 may also be delayed by various inorganic salts and organic substances, saccharose being particularly effective. Bordeaux mixtures after carbonization are slightly soluble in pure water, and dissolve readily in water containing carbon dioxid in solution. Bordeaux mixtures are soluble in water containing ammonic salts in solution. Alkaline Bordeaux mixtures are soluble in dextrose, saccharose, and other organic substances giving the biuret reaction. The physical state of the copper precipitate found in Bordeaux mixture is affected, irrespective of the ratio of cupric sulphate to calcic oxid, by (a) the dilution of the salts and the manner in which they are brought together; (b) the temperature of the water.

"After the cupric sulphate and calcic oxid have been brought together, a slight delay in stirring the mixture does not materially affect the physical state of the precipitate. Long continued stirring of Bordeaux mixture does not materially affect the physical state of the precipitate. The Bordeaux mixtures employed in practice fall into one or another of three types: (a) 'neutral' Bordeaux mixtures of which Woburn Bordeaux mixture is a true type and 'acid' Bordeaux mixture a proximate type; (b) slightly alkaline Bordeaux mixtures—neutral Bordeaux mixture is a good example of this class; (c) strongly alkaline, or basic Bordeaux mixtures; in this class belong those Bordeaux mixtures in which the ratio of cupric sulphate to calcic oxid is not greater than 2 to 1."

An introduction to the chemistry of plant products, P. HAAS and T. G. HILL (*New York, London, and Bombay, 1913, pp. XII+401, figs. 5*).—This work is an attempt to provide the botanist and students of botany having some acquaintance with chemistry with an introductory account of the chemistry and biological significance of the more important chemical substances occurring in plants. In some instances micro-chemical, qualitative, and quantitative methods are included.

Its contents include fats, oils, waxes, phosphatids, carbohydrates, glucosids, tannins, pigments, nitrogen bases, colloids, proteins, and enzyms.

On the demonstration of carotinoids in plants, C. VAN WISSELINGH (*K. Akad. Wetensch. Amsterdam, Proc. Sect. Sci., 15 (1912), pt. 1, pp. 511–526, 686–692, 693–700; K. Akad. Wetensch. Amsterdam, Versl. Wis en Natuurk. Afdeel., 21 (1912), No. 1, pp. 370–386, 565–572, 572–579*).—This article is in three parts.

I. *Separation of carotinoids in crystalline form.*—The results obtained by various investigators in regard to the carotins, or carotinoids, of plants are far from uniform. The microscopical findings are especially divergent and they conflict with those shown by the chemical and physical methods. Some investigators believe all carotinoids to be identical. On this account a study was made of the various micro-chemical methods, including the potash, dilute acid, and resorcinol methods.

"The results of the above crystallization experiments point strongly to the frequent occurrence of several distinct carotinoids in a plant."

II. *Behavior of carotinoids with regard to reagents and solvents.*—"The reagents by means of which coloration is brought about in carotinoids are the following: Concentrated sulphuric, sulphurous, and concentrated nitric acids, bromin water, concentrated hydrochloric acid with a little phenol or thymol, and iodin in potassium iodid or chloral hydrate solution. All these reagents cause blue coloration except the iodin reagent, which generally produces a green color.

"In this paper the use of sulphuric acid, bromin water, and iodin in potassium iodid solution is dealt with as well as two new reagents for carotinoids, namely, concentrated solutions of antimony trichlorid and of zinc chlorid both in 25 per cent hydrochloric acid."

The list of the organs and plants on which the new reagents were tested were (1) flowers of *Trollius caucasicus, Chelidonium majus, Isatis tinctoria, Spartium junceum, Thermopsis lanceolata, Cucurbita melanosperma, Ferula* sp., *Asclepias curassavica, Calceolaria rugosa, Dendrobium thyrsiflorum, Iris pseudacorus, Narcissus pseudonarcissus,* and *Lilium croceum;* (2) green leaves of *Chelidonium majus* and *Urtica dioica;* (3) fruits of *Sorbus aucuparia* and *Solanum lycopersicum;* (4) the root of *Daucus carota;* and (5) algæ, viz, *Cladophora* sp., and *Hæmatococcus pluvialis.*

III. *The leaf of Urtica dioica, the flower of Dendrobium thyrsiflorum and Hæmatococcus pluvialis.*—In the foregoing communication stress was laid on the fact that the carotinoids present differences in the color and shape of the

crystals and in their behavior toward reagents and solvents. Working on this basis it is shown that in the leaves of *U. dioica* two coloring matters were noted, namely, carotin and xanthophyll. This finding has been previously noted by Willstätter and Mieg.

D. thyrsiflorum contains two carotinoids. One of these is reddish orange in color and does not grow commonly in plants. The author believes that this substance is not a true carotinoid and belongs to the xanthophylls.

In *H. pluvialis* two carotinoids occur. This finding was previously made by Zopf but the procedures used by the two investigators were different.

The sugars and their simple derivatives. J. E. MACKENZIE (*London and Edinburgh, 1913, pp. XVI+242, figs. 17*).—The contents of this book are based on a course of lectures given at Birkbeck College, London, in 1903 and subsequently at the University of Edinburgh before students of pure chemistry, medicine, brewing and distilling, and sugar manufacture. The book is intended as a companion to works on physiological chemistry and to chemo-technological works.

Its contents include sugars; synthetic methods of preparation; manufacture of sucrose from the sugar cane and sugar beet; physical and chemical properties of sucrose; maltose; lactose; glucose; glucosamin; configuration; pentoses; methyl pentoses; aldohexoses; ketohexoses; disaccharids, trisaccharids, and tetrasaccharids; glucosids; fermentation; and metabolism.

The differentiation and specificity of starches in relation to genera, species, etc. E. T. REICHERT (*Carnegie Inst. Washington Pub. 173, 1913, pts. 1, pp. XVII+342+20, pls. 102; 2, pp. XVII+343-900+18, figs. 400*).—This is a preliminary report of an attempt to apply stereo-chemical principles to protoplasmic processes and products and to serve as a strictly scientific basis for the classification of plants and animals. It is a supplement to the report on the crystallography of hemoglobins by the same author (E. S. R., 22, p. 701).

The work deals with the literature pertaining to the starch grain, and also gives the histological appearance and behavior of the starches from many sources. Among the methods used were tests with iodin, anilin dyes, swelling reagents, the polariscope with and without the selenite plate, and gelatinization. In addition to this, curves of the reaction intensities and the histology of different starches were noted. Six hundred and twelve micro-photographs of starches are shown and the applicability of the results of the research to pharmacognosy, pharmacodynamics, systematic botany, and commercial pursuits is discussed.

Glycerids of butter fat. C. AMBERGER (*Ztschr. Untersuch. Nahr. u. Genussmtl., 26 (1913), No. 2, pp. 65–85*).—By fractional solution and crystallization pure individual glycerids can be obtained from butter fat. The least soluble glycerid, i. e., in ether, obtained from one fat consisted of tristearin (not quite pure), and from two others, palmityl-distearin. From another sample of butter a stearyl-dipalmitin was obtained.

The density and solution volume of some proteins. HARRIETTE CHICK and C. J. MARTIN (*Biochem. Jour., 7 (1913), No. 1, pp. 92–96*).—"A comparison has been instituted in case of four proteins, viz, caseinogen, egg and serum albumins, and serum globulin, between the density directly determined with dry specimens and that calculated from the specific gravity of concentrated solutions. The latter is found to be 5 to 8 per cent in excess of the former, showing the extent of shrinkage in volume taking place when these proteins enter colloidal solution."

For previous work see other notes (E. S. R., 29, p. 501).

The factors concerned in the solution and precipitation of euglobulin. HARRIETTE CHICK (*Biochem. Jour., 7 (1913), No. 3, pp. 318–340*).—"The isoelectric point for euglobulin has been redetermined and found to coincide with

the point of most rapid agglutination, viz. at a hydrogen ion concentration of about 3×10^{-6} normal, a figure which agrees with that obtained by Michaelis and Rona.

"The solution or dispersion of euglobulin by electrolytes is shown to be much influenced by the nature (especially as regards valency) of the constituent ions and to be of two general types: (a) 'Electrical' type of solution in which the euglobulin dispersion is accompanied by the acquisition of an electric charge by the protein particles, the sign of which is similar to that of the more potent ion of the electrolyte employed; (b) 'molecular' type of solution, in which the dissolved euglobulin is electrically neutral.

"In type (a) the dispersion is considered to result from a specific adsorption of the ion possessing the higher valency, in (b) from a molecular union with (Hardy) or adsorption of (Schryver) the salt as a whole. Both types of solution are accompanied by loss of electrical conductivity in the liquid.

"The electrical type of solution is well seen in case of dispersion by such salts as sodium citrate and lanthanum nitrate in low concentration; in case of the more ordinary salts, containing mono- or divalent ions only, the electric forces concerned are not powerful enough to disperse globulin until the concentration is raised to a point where molecular solution takes place. In the case of sodium citrate, the electrical type of solution was found to change to the molecular type as the concentration of the salt was increased.

"Euglobulin, when denatured by heat, no longer possesses the property of forming the molecular type of solution with electrolytes. On heating the latter, in some cases the degree of dispersion is merely diminished, and the protein particles acquire an electric charge, whose sign is determined by the more potent ion of the electrolyte employed; in other cases agglutination takes place.

"The reaction of acid and alkaline solutions of euglobulin is greatly influenced by the addition of electrolytes, the hydrogen and hydroxyl ion concentration being reduced respectively. In case of the former the effect is much increased with rising valency of the anion, and in alkaline solution the result is determined by the valency of the cation. The influence of electrolytes in causing precipitation of globulin dissolved in acid and alkali may, in some instances, be adequately explained by the alteration in reaction; in this way solutions too acid or too alkaline for agglutination of the globulin may be adjusted to the isoelectric point by the addition of an appropriate electrolyte.

"Precipitation by electrolytes may, however, also take place in solutions whose reaction is still far removed from that of the iso-electric point. In these instances it is attributed to neutralization of the electric charge originally carried by the protein particles by means of a specific adsorption of the oppositely charged ion of the electrolyte; the effect is related to valency.

"In the properties regarding solution and precipitation . . . euglobulin, in common with caseinogen and the vegetable globulins, presents a very interesting analogy with heat-denatured proteins. Euglobulin differs from heat-denatured protein in its capacity to form solutions with electrolytes in which the protein particles are electrically neutral."

The hydrolysis of organic phosphorus compounds by dilute acid and by dilute alkali, R. H. A. PLIMMER (*Biochem. Jour., 7 (1913), No. 1, pp. 72–80*).—In these experiments it was found that ethyl phosphoric acid, glycerophosphoric acid, and phytic acid are hydrolyzed by acid but are not affected by alkali. Stability to alkali is consequently considered a property of phosphoric acid esters.

"It is not known how the phosphoric acid is combined in phosphoprotein, but it is probably united with one of the amino acids. Hexosephosphoric acid

reduces Fehling's solution, which points to the presence of the functional aldehyde or ketone group in the molecule."

Suggestions in regard to the possible atomic grouping of the above are appended.

Action of hydrogen chlorid upon diastase, I, T. PANZER (*Hoppe-Seyler's Ztschr. Physiol. Chem., 82 (1912), No. 3–4, pp. 276–325; abs. in Centbl. Bakt. [etc.], 2. Abt., 37 (1913), No. 11–13, p. 281*).—After studying the effects of dry hydrogen chlorid gas upon diastase, the author concludes that a chemical combination of the ferment and gas is necessary for amyloclastic activity.

Action of hydrogen chlorid upon invertase, II, T. PANZER (*Hoppe-Seyler's Ztschr. Physiol. Chem., 82 (1912), No. 5, pp. 377–390; abs. in Centbl. Bakt. [etc.], 2. Abt., 37 (1913), No. 11–13, p. 281*).—Invertase absorbs much hydrogen chlorid but loses its activity as a result. There is probably a difference between the chemical constitution of diastase and invertase.

Saccharifying diastase of malt and the reaction of the medium, H. VAN LAER (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 14 (1912), Sect. VIb, pp. 203–213*).—This is a study of the influence of various amounts of acid and alkali on diastase obtained from malt extracts of different kinds.

The inhibition produced by an excess of either an acid or an alkali is deemed due to the formation of an inactive compound between the enzym and the acid or alkali. The loss in acidity in the presence of hydrogen ions and hydroxyl ions is due to three principal causes, (1) the destruction of a part of the enzym which is not reversible, (2) the temporary mobilization of a portion of the enzym, and (3) an increase in the activity caused by a loss in ions and due to the influence of stabilization.

Book of methods (*Methodenbuch. Vienna, 1913, pp. XVI+307, figs. 9*).—This is the first edition of a treatise on methods compiled by the Association of Austrian Experiment Stations. The methods are for soils (general and special methods), moor soils, artificial fertilizers, peat straw and peat mull, commercial feeding stuffs, feed lime, condition powders, seeds, fats, waxes, oils and varnishes, cane sugar, molasses, sugar beets, bone charcoal, starch, alcohol, wine residues, sulphur, water, sewage, vegetable tanning materials, and foods.

Winkler's method for the determination of carbon dioxid in water, J. CASARES and S. PINA DE RUBIES (*Ann. Chim. Analyt., 18 (1913), No. 4, pp. 133–136; abs. in Chem. Abs., 7 (1913), No. 19, p. 3377*).—In these experiments, which were made with pure sodium carbonate in solution, an average error of 2.5 per cent was noted. This was about six times the error found by the originator of the method. The results were inconstant even with identical amounts of sodium carbonate, and the error did not depend upon the amount of hydrogen passed through the apparatus. It increased rapidly as the amount of carbon dioxid decreased.

Colorimetric determination of small amounts of manganese in drinking water, E. SCHOWALTER (*Ztschr. Untersuch. Nahr. u. Genussmtl., 26 (1913), No. 2, pp. 104–108*).—When estimating manganese by conversion into permanganate with nitric acid and ammonium persulphate it is of importance first to remove any chlorids which may be present. This is done by the addition of silver nitrate, but the turbidity produced interferes with the subsequent colorimetric estimation. It is not possible to remove the hydrochloric acid by heating the water with sulphuric acid and ammonium persulphate.

Silver nitrate seems to be active in the reaction when permanganate is being formed and consequently the author prefers the following procedure for determining manganese: One hundred cc. of water is evaporated with 10 cc. of

nitric acid to dryness and then taken up with 10 cc. of water and 5 cc. of nitric acid. The solution is filtered through a small filter into an Erlenmeyer flask. The dish and filter are then washed with a measured amount of water until 35 cc. of filtrate is obtained. After adding 5 cc. of nitric acid and 1 gm. of ammonium persulphate (in most cases 0.5 gm. is sufficient), the solution is heated to boiling point. Then 10 drops of silver nitrate 1:20 is added, and from the time a reddish color appears, boiled for 1 to 1½ minutes. After cooling, the solution is transferred to a clean, dry cylinder, made up to 50 cc. with water, and compared with a standard solution of permanganate contained in an identical cylinder.

An iron content of 10 mg. per 1,000 cc. does not affect the results.

A note on the Hopkins and Cole modification of the Adamkiewicz test for protein, V. H. MOTTRAM (*Biochem. Jour.*, 7 (*1913*), *No. 3, pp. 249–259*).—The Hopkins and Cole modification of this reaction fails in the presence of small amounts of oxidizing agents. "The following method of carrying out the test yields excellent results:

"One cc. of strong 'reduced oxalic' acid (Benedict's reduced oxalic will do just as well) is mixed with 1 cc. of 1 per cent Witte peptone, and then 2 cc. of sulphuric acid is run down the side of the test tube which is held as near horizontal as convenient. The fluids are then rapidly mixed by shaking from side to side with the test tube vertical. The quantities given are for a test tube 1.5 cm. in diameter (the usual laboratory size). Subsequent addition of one drop of 1 per cent ferric chlorid solution usually increases the density and the blueness of the coloration.

"The quantities given may be varied greatly and yet a good coloration be obtained. One cc. or 5 cc. of sulphuric acid to 2 cc. of the mixture yields an unmistakable result and the quantities may be guessed and not measured. More sulphuric acid gives a bluer result than less."

The estimation of tyrosin in proteins by bromination, R. H. A. PLIMMER and ELIZABETH C. EAVES (*Biochem. Jour.*, 7 (*1913*), *No. 3, pp. 297–310*).—"The estimation of small quantities of tyrosin—0.01 to 0.04 gm.—can be effected by J. H. Millar's[a] method of bromination when a more dilute solution of sodium bromate is used, but it is preferable to modify his procedure by adding excess of the reagent and titrating the nonabsorbed halogen with thiosulphate solution, using potassium iodid and starch as indicator.

"Tyrosin can not be directly estimated by bromination in the presence of protein and its decomposition products, since histidin and tryptophan also absorb bromin. Histidin can be removed by precipitation with phosphotungstic acid. The absorption of bromin by tryptophan is not completely eliminated after boiling with acids, so that tyrosin can not be estimated by this method in solutions containing the products of acid hydrolysis of proteins which contain tryptophan. Values for the tyrosin content of proteins, agreeing with those obtained by isolation and weighing, are obtained when the bromin absorption of a tryptic digest is measured after an interval of about six hours."

The separation of cystin and tyrosin, R. H. A. PLIMMER (*Biochem. Jour.*, 7 (*1913*), *No. 3, pp. 311–317*).—This work shows that cystin and tyrosin can be separated from one another by a precipitation with phosphotungstic acid. Practically all of the tyrosin can be determined in the filtrate and washings. The two amino acids may also be separated by a precipitation with mercuric sulphate in 5 per cent sulphuric acid, but the cystin is incompletely precipitated and the tyrosin which is recovered is impure.

[a] Trans. Guinness Research Lab., 1 (1903), pt. 1, pp. 40–44.

"Cystin and tyrosin can be completely and quantitatively separated by means of absolute alcohol saturated with hydrogen chlorid. The tyrosin is rapidly converted into tyrosin ester and goes into solution. It can be recovered by boiling the solution when diluted with water for eight hours and then neutralizing with ammonia. Almost the whole of the cystin is insoluble; the portion which goes into solution (perhaps cystin hydrochlorid) is precipitated by adding an equal volume of absolute alcohol. The cystin is not converted into its ethyl ester since on dissolving the insoluble portion in dilute hydrochloric acid and neutralizing with ammonia the cystin is precipitated in the typical hexagonal plates."

Determination of amino nitrogen in the tissues, D. D. VAN SLYKE (*Jour. Biol. Chem., 16 (1913), No. 2, pp. 187–195*).—"The amino acids are extracted from the tissues with hot water. Uncoagulated proteins in the extract are precipitated by alcohol. Alcohol and the slight amount of ammonia present in the extract are removed by concentration in vacuum, and the amino nitrogen in the residue is determined by the nitrous acid method. The rapidity with which the amino nitrogen reacts with nitrous acid, and the relatively small increase which it shows as the result of hydrolysis of the extract with hydrochloric acid, indicate that the amino nitrogen determined by the method outlined represents approximately the free α-amino acids. Only a few per cent of the amino nitrogen appears due to proteins or their intermediate products and to amins not of protein origin. The correction for the latter can, when desirable, be readily determined."

Testing animal fat for phytosterol, M. FRITZSCHE (*Ztschr. Untersuch. Nahr. u. Genussmtl., 26 (1913), No. 11, pp. 644–648*).—The digitonin method of Marcusson and Schilling, while very satisfactory, requires 24 hours for its execution. The method has now been modified so as to require only two hours, as follows:

Fifty gm. of the melted and clear filtered fat is heated in a 150-cc. beaker with 20 cc. of a 1 per cent digitonin solution to from 60 to 70° C., and stirred at this temperature for five minutes with a mechanical stirring device. Fluid and semisolid fats are filtered, with the aid of suction, through an easily permeable Büchner funnel holding a 50-mm. diameter filter disk. The residue is then washed with ether six successive times with the aid of gentle suction.

While still warm the solid fats are treated, after the stirring process, with 20 cc. of chloroform, filtered under pressure, and washed twice with 5 cc. of warm chloroform and six successive times with 5 cc. of ether aided by slight suction. The fat-free residue (digitonin) with the filter disk is dried for five minutes on a watch glass at from 30 to 40°, and after the removal of the filter. The residue is transferred to a dry test tube provided with a cooling tube and heated with 2 cc. of acetic acid anhydrid to liquefaction with a small flame and then heated five minutes longer. The hot fluid is filtered through cotton into a crystallizing dish and the test tube and funnel washed twice with 0.5 cc. of warm absolute alcohol. The residue is then dried upon the water bath aided by a current of air, 1 cc. or less of absolute alcohol is added, covered with a watch glass, heated to solution, cooled, and the solution, etc., poured after crystallization has set in, upon a porous clay plate. When the mother liquor has been absorbed, the crystals are transferred to a crystallization dish.

A small portion of the crystalline mass is heated on a watch glass ten minutes at 70° and then employed for the melting point determination. The remainder of the residue is dissolved in absolute alcohol and used for a second, third, and possibly a fourth determination. Paraffin when present does not affect the results.

Some tests with beef tallow, oleomargarin, lard, and butter are included.

Estimation of sugar by the biological method, A. J. KLUYVER (*Abs. in Centbl. Bakt. [etc.], 2. Abt., 38 (1913), No. 21–25, pp. 648, 649*).—In contradistinction to other workers (Prior, König and Hörmann, and Geelmuyden), the author introduces large quantities of yeast into relatively small amounts (1 to 2 cc.) of sugar solution held in a special form of fermentation saccharometer. Within 40 hours the fermentation is finished and from the amount of carbon dioxid produced the amount of sugar fermented is calculated.

The method is deemed useful for studying carbohydrate metabolism in plants and animals.

Estimation of iron in presence of organic substances, E. SALKOWSKI (*Hoppe-Seyler's Ztschr. Physiol. Chem., 83 (1913), No. 2, pp. 159–164; abs. in Jour. Chem. Soc. [London], 104 (1913), No. 605, II, pp. 248, 249*).—This is a critical study of the difficulty experienced in the estimation of iron in organic substances. "The iron is converted by fusion with a mixture of alkali nitrate and carbonate into oxid, the fused mass dissolved in water, and the iron oxid collected on an ash-free filter. It is advantageous to carry out the washing with a 10 to 15 per cent solution of ammonium nitrate, and finally to fill the filter with alcohol. A further difficulty is often experienced in removing all traces of iron oxid from the platinum dish."

The method of estimation of iron as ferric phosphate was examined and found to be very unsatisfactory. Washing the ferric phosphate precipitate with ammonium acetate did not remove the difficulties.

The soluble nitrogenous substances as a factor for judging flours, E. ROUSSEAUX and M. SIROT (*Ann. Chim. Analyt., 18 (1913), No. 6, pp. 224–228*).—It sometimes occurs that the results obtained by analyzing flours according to the usual methods (moisture, ash, fat, dry gluten, acidity, and fineness) indicate a good flour, but when the flour is submitted to a practical baking test, it furnishes a bread, etc., of inferior quality. The author therefore deems it advisable to take into account the total and soluble nitrogenous substances contained in the flour.

A flour suitable for baking purposes contains a ratio of total to soluble nitrogen of 5.72:1 (data obtained from 26 analyses of satisfactory and unsatisfactory flours). The total nitrogenous substances were determined by Kjeldahl's method in a 2-gm. sample of flour.

For estimating the soluble nitrogenous substances, mix 10 gm. of flour with 150 cc. of water in a 200-cc. flask and then place in a boiling water bath for from 2 to 5 minutes, shaking frequently during the interval. Take away the burner from the water bath, remove the flask, cool, shake, filter, and determine the nitrogen in 50 cc. of the filtrate (2.5 gm. of flour) by Kjeldahl's method.

The polarimetric determination of starch in rye and wheat flours, MACH (*Abs. in Österr. Ungar. Ztschr. Zuckerindus. u. Landw., 42 (1913), No. 6, pp. 1011, 1012*).—The purpose of this work was to determine especially the starch content of feeds, and furthermore, whether typical samples of rye and wheat by-products can be used as a basis for judging the by-products of the industries dealing with these commodities. Seven samples of material were studied in this connection and the Lintner, Lintner-Wenglein, and Ewers methods were used for determining the starch.

The conclusions reached were that the polarimetric methods are not so refined that they can be called exact and reliable. On the other hand, these methods, especially Ewers' (E. S. R., 21, p. 108) do furnish results which will aid in judging rye and wheat by-products.

A new method for examining baked goods, A. SCHMID (*Chem. Ztg., 36 (1912), No. 83, p. 796; Mitt. Lebensm. Untersuch. u. Hyg., Schweiz. Gsndhtsamt.,*

3 (1912), No. 3, pp. 193–199).—A method recommended for noting whether eggs (yolk or the entire egg) have been used in the preparation of baked goods is to determine the soluble proteins present. The procedure, which is provisional, is as follows:

Thirty gm. of material is powdered and passed through a No. 5 universal sieve into a 200 cc. flat-walled medicine bottle with 150 cc. of water and the mixture shaken for 30 minutes. The solution is then set aside, and if it does not clear it is centrifuged; 20 cc. of the clear solution is placed in a tube graduated in 0.1 cc. at its lower (tapered) end which is immersed in a water bath at 50° C. and the temperature raised to 80 to 85°. It is held at the latter point for ten minutes when 2 cc. of a 10 per cent nitric acid solution is added. After ten minutes the tube with its contents is centrifuged at 1,400 revolutions per minute and the volume of the precipitate read off. A comparison is made with a solution containing a known amount of eggs.

Determination of saccharin in foods. J. KARAS (*Ztschr. Untersuch. Nahr. u. Genussmtl., 25 (1913), No. 9, pp. 559, 560*).—It is often difficult to extract saccharin from solutions containing substances like starch, dextrin, etc., owing to emulsion formation with the solvent, or, when examining cordials, substances are often present which mask the taste of saccharin or prevent its crystallization.

A method suggested is as follows: Remove by evaporation the alcohol present in the sample or in a water extract thereof, and concentrate until it has a definite sweet taste; cool, add an aqueous solution of tannin (for 100 cc. of fluid add about 10 to 15 cc. of a 10 per cent tannin solution), shake, add 5 to 8 cc. of lead subacetate solution, and filter. Acidify the filtrate with phosphoric acid, filter off the lead precipitate, and shake the filtrate with a mixture of equal parts of ethyl and petroleum ethers. After evaporating off the ethers, a residue of pure saccharin is obtained.

It is not necessary to convert the saccharin into salicylic or sulphuric acid. When much fat is present, make alkaline with sodium hydroxid before clarification and extract with ethyl alcohol.

Examination of altered milk. L. VUAFLART (*Ann. Falsif., 6 (1913), No. 53, pp. 148, 149*).—The method of Kling and Roy (E. S. R., 22, p. 414) and the modification thereof proposed by Ronnet were studied and the difficulties experienced are pointed out. The greatest difficulty was with the quantitative extraction of fat from the coagulum. The procedure now followed consists of placing the coagulated milk in a Schleicher and Schull thimble, and, after removal of the serum by filtration, drying the coagulum at from 100 to 105° C. and extracting for an hour with ether. The extraction is then stopped, the coagulum rubbed up in a mortar and placed again in the thimble, and extracted for from one to two hours longer.

For estimating the protein, 250 cc. of the clear serum is evaporated in an 800-cc. flask to sirupy consistency; 150 cc. of sulphuric acid and a little mercury are added and the solution heated until nearly clear, when the coagulum in the thimble, thimble and all, is added and the process continued until completion.

In contradistinction to Kling, who considers that 1.033 gm. equals 1 liter of milk and who takes 32 gm. of fat and 33 gm. of protein as a minimum, the author takes Ronnet's figures, namely, 1.030 gm. for 1 liter of milk, 30 gm. for fat, and 29 gm. for protein. The latter figures are deemed more closely representative of the milks occurring in the north of France.

Analysis of altered milk. A. GASCARD (*Ann. Falsif., 6 (1913), No. 60, pp. 525–530*).—A review and study of methods for examining decomposed milk.

The calculation of the coconut-fat content of butter according to the Polenske method. T. SUNDBERG (*Ztschr. Untersuch. Nahr. u. Genussmtl., 26*

(1913), No. 8, pp. 422–424).—High results for coconut fat were obtained by the Polenske method of calculation (E. S. R., 15, p. 850). The method of calculation is deemed faulty on account of the figure which is taken as a standard for butter, and which does not represent the original butter.

The estimation of the Reichert-Meissl and Polenske numbers, A. Goske (*Ztschr. Untersuch. Nahr. u. Genussmtl., 26 (1913), No. 11, pp. 651, 652, fig. 1*).—Many of the nonconcordant results obtained from these determinations are attributed to improper saponification. The chief requirement for proper saponification is a definite end temperature. This has been determined and a special form of apparatus for the work is suggested and illustrated.

Testing butter for preservative, W. E. Gwillim (*Jour. Agr. [New Zeal.], 8 (1914), No. 1, pp. 64–67, fig. 1*).—The fact that butter designed for shipment to the United States must be free of preservatives is pointed out. As most butter preservatives consist of a mixture containing boron compounds, methods are described for detecting these substances in butter, milk, or cream.

Contribution to the examination of cheese, E. Reuchlin and F. Rachel (*Ztschr. Untersuch. Nahr. u. Genussmtl., 26 (1913), No. 1, pp. 20–38*).—These studies, which were made with a large variety of cheeses, emphasize the fact that the Siegfeld method for determining moisture (E. S. R., 24, p. 14) gives in a short time figures which compare well with those furnished by other methods. The Buttenberg and Koenig dry method (E. S. R., 23, p. 182), without the use of distributing agents, often yields low results.

The direct method of Mai and Rheinberger (E. S. R., 28, p. 612), when compared with other figures obtained by the same method, gives results which are fairly comparable, but are higher or lower than the indirect method. The alkaline distillate obtained in this method allows a determination of ammonia at the same time, which may possibly serve as a criterion for judging the ripeness of cheese.

Farnsteiner's method[a] yields results for fat which are comparable with the figures obtained from the Rondzynski and Ratzlaff method (E. S. R., 16, p. 440).

The article also discusses many of the other methods proposed for the estimation of moisture and fat in cheese.

Short notes from practice. W. Arnold (*Ztschr. Untersuch. Nahr. u. Genussmtl., 26 (1913), No. 11, pp. 654–656*).—This consists of methods for detecting (1) coloring matters in edible fats, (2) sesame oil in margarin which contains hydrochloric acid and reddening substances, and (3) butter with a suspiciously low olein content.

Short notes from practice, A. Goske (*Ztschr. Untersuch. Nahr. u. Genussmtl., 26 (1913), No. 11, pp. 652–654, figs. 2*).—A description of a special water bath, a universal pycnometer, and a sedimentation glass with a glass stopcock at its lower end.

METEOROLOGY—WATER.

Weather fallacies, A. O. Walker (*Bot. Jour. [London], 2 (1914), No. 9, pp. 232–235*).—This article indicates certain respects in which meteorological observations as ordinarily reported fail to meet the requirements of the farmer. For example, monthly and annual summaries of rainfall are considered to be of little practical value, as more detailed information regarding the distribution of rainfall is necessary.

[a] Ztschr. Untersuch. Nahr. u. Genussmtl., 7 (1904), No. 2, pp. 105, 106, fig. 1.

It is suggested that in order that temperature observations may be of practical value the means of all important periods of heat and cold, irrespective of the calendar, ought to be published in an easily accessible form. Mean minima are also useless. It is only the extreme range of temperature and the absolute minimum that is deemed of significance in relation to plant growth.

Meteorological observations at the Hamburg Observatory, 1912, R. SCHORR (*Jahrb. Hamburg. Wiss. Anst., 30 (1912), Beiheft 4, pp. 50*).—Detailed observations on temperature of the air and soil, pressure, moisture, precipitation, cloudiness, and wind for each month of the year are reported in tables.

Annual report of the director of the [Philippine] Weather Bureau for the year 1911, J. ALGUÉ (*Ann. Rpt. [Philippine] Weather Bur., 1911, pt. 3, pp. 266*).—This contains a record of hourly meteorological observations made at the secondary stations during the calendar year 1911.

The influence of weather conditions upon the amounts of nitric acid and of nitrous acid in the rainfall near Melbourne, Australia, V. G. ANDERSON (*Chem. News, 110 (1914), No. 2859, p. 127*).—The results of determinations of nitric and nitrous acids in rain water at Canterbury from November 1, 1912, to February 28, 1914, are reported and discussed in connection with similar data from other sources.

The data indicate that these acids are formed in rain water in equal molecular proportions and this points to nitrogen peroxid in the atmosphere as their source. These proportions are maintained for some time in cold weather but in hot weather the nitrous acid is rapidly converted into nitric acid. As a result the ratio of nitric nitrogen to nitrous nitrogen is highest in summer and lowest in winter.

It was found that "the concentration of nitric acid reached a maximum in summer, a minimum in winter, and an intermediate position during autumn and spring. The concentration of nitrous acid reached a maximum in winter and a minimum in summer." The amount of oxidized nitrogen per acre carried down by rain falling on any day appears to be a function of a type of weather and within certain limits is independent of the amount of rainfall. The oxidized nitrogen content of the rainfall corresponding to nine well defined recurring types of weather is computed from various observations which have been made in different parts of the world. This content is shown to be much higher in the tropical than in the temperate and antartic types.

Artesian water in Missouri, A. W. MCCOY (*Univ. Mo. Engin. Expt. Sta. Bul., 4 (1913), No. 3, pp. 72, figs. 10*).—It is the purpose of this bulletin to outline the general artesian conditions in Missouri. It is attempted to furnish data as to what depths water may be reached, how high it will rise in the well, through what formations the drill must pass, what compounds the water is liable to contain, amount of discharge from the ordinary well, and the general economic conditions as compared with other sources,

The waters of Russian Turkestan and the future for the cultivation of the soil, WOEIKOF (*Ztschr. Gesell. Erdk. Berlin, No. 5 (1914), pp. 341–355*).—Data on the surface water supplies and precipitation in Russian Turkestan are given, and discussed with reference to the possibilities of irrigation farming in that territory.

The climate of Turkestan is said to be warm and arid for six months of the year, with plenty of sunshine. The precipitation is relatively small but the streams are well supplied with water from mountain snow and ice. Floods in these streams are said to follow usually extremely warm weather. Such floods are said to occur at times when they will be most useful to such crops as cotton, rice, forage, etc., but owing to the imperfect native contrivances for storing and utilizing water approximately 3,500 cubic meters (123,550 cu. ft.) per second is

wasted during the six warm months. One cubic meter per second is said to be sufficient to irrigate 1,000 hectares (2,470 acres). The area at present irrigated is about 9,880,000 acres, but much of this area receives water for so short a time that cotton can not be grown.

The influence of ocean spindrift and blown spray on the chlorin content of inland ground waters, W. BARR (*Jour. Hyg. [Cambridge], 14 (1914), No. 1, pp. 119–128, figs. 3*).—Studies of the ground waters of that part of Scotland lying south of the river Forth, an area which shows appreciable differences in its meteorological conditions, led to the conclusions that the ocean, through the agencies of ocean spindrift and blown spray deposited on the land by all forms of precipitation, has an influence on the chlorin content of inland ground waters which is not limited to waters near the seaboard only but varies in intensity with the distance from the seaboard. This influence is also modified by the configuration of the land surface and to some extent depends on the direction of the prevailing winds from seaward.

Except where beds of salt occur, chlorin in inland ground waters is not due to the geological character of the water-bearing strata but is derived from the sea. It is further concluded that the chlorin figure may be utilized as a preliminary means of gaging the purity, or otherwise, of water samples from a district where the normal chlorin content has been established.

The location of water by means of the divining rod and automatic water finder, G. B. BROOKS (*Queensland Agr. Jour., n. ser., 2 (1914), No. 3, pp. 183–193, figs. 8*).—The author defends the divining rod and the automatic water finder, claims the ability of locating underground water by them, and gives experimental data to substantiate his claims. He states that the factors affecting the results obtained by a divining rod are thunderstorms, atmospheric moisture, and other weather conditions, proximity to growing timber, heavy clay subsoil, and ironstone or other minerals, the time of day, and the physical condition of the diviner.

Rural water supplies, E. BARTOW (*Univ. Ill. Bul., 10 (1913), No. 36, pp. 79–84, figs. 2*).—A classification of rural water-supply samples examined by the State Water Survey during the years 1907–1912, on the basis of their analyses considered in conjunction with their source and the surroundings of the well, is reported. The average number condemned decreased with the depth of the well. This was true but to a less extent with samples collected from typical wells. Many of the deepest wells were condemned owing to their mineral content. Three-fourths of the shallow wells examined were contaminated and 45 per cent of the samples of unknown origin were condemned.

Information is given regarding the protection of shallow wells.

SOILS—FERTILIZERS.

Soil survey of Ashley County, Arkansas, E. S. VANATTA ET AL. (*U. S. Dept. Agr., Advance Sheets Field Operations of the Bureau of Soils, 1913, pp. 5–39, fig. 1, map 1*).—This survey was issued March 13, 1914. It deals with soil characteristics and crop adaptabilities of an area of 596,480 acres in southeastern Arkansas which is broadly divided into uplands and bottom lands. The upland soils are both loessial and sedimentary. Although drainage is poor in many cases, it is stated that "topographically practically the entire area of the county is easily tillable." Twelve soil types are mapped, the Richland silt loam being by far the most extensive. Agriculture is stated to be growing in importance, but it is not yet well developed in the county.

Soil survey of Bradford County, Florida, W. C. BYERS ET AL. (*U. S. Dept. Agr., Advance Sheets Field Operations of the Bureau of Soils, 1913, pp. 36,*

fig. 1, map 1).—This survey, made in cooperation with the Florida State Geological Survey, was issued July 24, 1914. It deals with soil characteristics and crop adaptabilities of an area of 344,960 acres in northeastern Florida, the topography of which varies from flat to hilly. The soils of the area are broadly grouped into sedimentary, alluvial, and cumulose soils, and their greatest general requirement is said to be drainage, which should be followed by liming. Fourteen soil types of six series are mapped, with Portsmouth fine sand predominating. Although only a small part of the county is under cultivation, agriculture is said to be entering a period of development.

Soil survey of Gordon County, Georgia, J. O. VEATCH (*U. S. Dept. Agr., Advance Sheets Field Operations of the Bureau of Soils, 1913, pp. 70, fig. 1, map 1*).—This survey, made in cooperation with the Georgia State College of Agriculture, was issued July 10, 1914. It deals with soil characteristics and crop adaptabilities of an area of 238,080 acres in northwestern Georgia, which consists of three principal topographic divisions, viz, a narrow mountainous area extending practically the entire width of the western boundary of the county, a mountainous area occupying the extreme eastern part, and a great valley approximately 20 miles in width lying between. There is a diversity of soils which are principally residual in origin. Thirty-nine soil types of 21 series are mapped, the loam and silt loam classes predominating. It is stated that the agricultural possibilities of the county have hardly been realized.

Soil survey of Miller County, Georgia, R. T. ALLEN and E. J. GRIMES (*U. S. Dept. Agr., Advance Sheets Field Operations of the Bureau of Soils, 1913, pp. 34, fig. 1, map 1*).—This survey, made in cooperation with the Georgia State College of Agriculture, was issued August 22, 1914. It deals with soil characteristics and crop adaptabilities of an area of 176,000 acres in southwestern Georgia, the topography of which is flat to gently rolling, varied here and there by limestone sinks. The soils of the area are derived from the Coastal Plain deposits and are consolidated and unconsolidated. Drainage is for the most part good and practically all of the upland portion of the county is said to be well suited to tillage operations and to the use of labor-saving machinery. Seventeen soil types of nine series are mapped, the Norfolk sandy loam with its two phases being the most extensive and important.

Agrology of Sahel, I. POUGET, F. LÉONARDON, and D. CHOUCHAK (*Agrologie du Sahel.—I, Sahel d'Alger. Algiers, 1913, pp. 84; abs. in Rev. Gén. Sci., 25 (1914), No. 10, pp. 331, 332*).—The results of physical, mechanical, and chemical analyses of soils of the region are reported and discussed with reference to the ease with which the soils may be cultivated and with reference to plant nutrition. A geological chart of the region is also given.

Study of Hungarian soils by means of their water solutions, R. BALLENEGGER (*Földtani Közlöny, 43 (1913), No. 7–9, pp. 317–324; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 3, pp. 336, 337*).—Analyses of water solutions, as well as determinations of moisture, electrical conductivity at 18° C., and alkalinity were made on samples of 75 typical Hungarian soils. See also a previous note (E. S. R., 30, p. 516).

The author concludes from the results that the water solutions may be used to characterize the various types of soils. Thus the water solutions of the poor, gray forest soils were found to contain the least soluble matter. On the other hand, the very fertile Alföld soils were found to be rich in soluble matter. The distribution of the soluble matter also varied in the different types of soil.

Some adsorption phenomena in soils and kaolin, J. E. HARRIS (*Jour. Phys. Chem., 18 (1914), No. 4, pp. 355–372; abs. in Jour. Chem. Soc. [London], 106 (1914), No. 619, I, pp. 643, 644; Chem. Abs., 8 (1914), No. 12, p. 2209*).—Investigations are reported which show that the liberation of acid when soils are

shaken up with solutions of sodium chlorid, potassium nitrate, and sodium acetate is not due to double decomposition in which insoluble humic acids are involved but to adsorption of the base of the salt.

Acid was set free by similar reactions when solutions of the salts named were shaken up with kaolin.

"That the acid is not adsorbed by the soil and kaolin and liberated again when treated with a salt solution was shown by treating samples of soil and kaolin with sulphuric acid, washing out the acid, and treating with potassium nitrate solution. Although a soluble acid was set free in the potassium nitrate solution, no evidence of the presence of the sulphate radical could be found. This showed that there had been no adsorption of the acid.

"To show that the base of the salt is actually adsorbed by the soil and kaolin, samples of these substances were treated with dilute hydrochloric acid, and then with a barium chlorid solution, the amount of acid that was set free in the solution being determined. The soil and kaolin after being thoroughly washed were treated again with hydrochloric acid and the amount of barium recovered by this process determined. It was found that the barium recovered in the case of the soil corresponded to 95 per cent of the acid liberated in the barium chlorid solution and to 89 per cent in the case of the kaolin. The soil was found after this second treatment with hydrochloric acid to have regained all its original capacity for liberating an acid from a salt solution.

"Finally it was found that a soil which had been boiled for six or seven hours with concentrated sulphuric acid to remove the organic matter, after being washed to remove the soluble acid, had the power of setting free almost exactly the same quantity of acid from a salt solution as a sample of the same soil which had been treated with twentieth-normal or fortieth-normal acid and in which all the organic matter was present. This would indicate that acid soils of the sort investigated (sandy loams) owe their acidity not to organic matter but to inorganic matter, probably to hydrated silicates."

The nonexistence of magnesium carbonate in humid soils, W. H. MacIntire, L. G. Willis, and J. I. Hardy (*Tennessee Sta. Bul. 107 (1914), pp. 151–202, figs. 4*).—This is a full account of investigations more briefly noted elsewhere (E. S. R., 31, p. 25).

In basket and pot experiments magnesium carbonate equivalent to applications of 8 tons per acre of calcium carbonate in excess of the lime requirement, as shown by the Veitch method, was entirely decomposed after contact, without leaching, with fallow soils of three distinct types for a period of one year. Similar experiments under field conditions showed that magnesium carbonate equivalent to 28,180 lbs. of calcium carbonate per acre (2,000,000 lbs.) of soil had been entirely decomposed at the end of 8 weeks without leaching, while in soils treated with equivalent amounts of precipitated calcium carbonate the carbonate was still plainly discernible.

It was found in laboratory experiments that sand, both coarse and fine, clay, silt, opal, kaolin, kaolinite, bauxite, hornblend, rutile, soapstone, serpentine, and aluminum silicate, as well as the three different types of soils experimented with, decomposed precipitated magnesium carbonate and dolomite, with evolution of carbon dioxid, by moist contact at room temperatures both with and without the presence of precipitated calcium carbonate. Pure alkaline silicon dioxid, hydrated and dehydrated, decomposed precipitated calcium and magnesium carbonates and dolomite at room temperatures. The magnesia of precipitated magnesium carbonate also showed a strong affinity for alkaline titanium oxid at room temperatures. In all cases the magnesium compounds showed a greater affinity for the substances named and underwent more rapid decomposition than did the calcium compounds. The great affinity of mag-

nesium carbonate for silicon dioxid, hydrated silicates, and titanium oxid is thought to account for the decomposition and rapid disappearance of magnesium carbonate in the pot and field experiments.

The general conclusion is reached that "except for the minute quantities in soil moisture, resulting from hydrolyzation of silicates, or immediately after carbonate treatment, before decomposition has been effected, magnesium is not to be found in the carbonate form in surface soils."

While it is shown that the large applications of magnesium carbonate were decidedly toxic to wheat, it is thought "that ground dolomite might be used even in excessive amounts without any immediate toxic effect upon plant growth. However, the greater loss of lime by leaching of carbonate and hydrolyzed silicates would produce at some future time conditions which would necessitate extensive liming to overcome magnesia poisoning."

A bibliography of 55 references to literature bearing on the subject is given.

The effect of strongly calcareous soils on the growth and ash composition of certain plants, P. L. Gile and C. N. Ageton (*Porto Rico Sta. Bul. 16 (1914), pp. 45, pls. 4*).—The plan of the investigations reported in this bulletin was to grow several species of plants in adjacent field plats containing varying amounts (5, 18, and 35 per cent) of calcium carbonate and then measure the yield and determine the composition of the ash of the plants from the different plats.

The plats were prepared by digging holes 10 ft. wide by 20 ft. long and 2 ft. deep in a clay soil, leaving a bank 3 ft wide between each plat. These holes were filled with clay, sand, and disintegrated limestone in proportions to furnish soils of the desired texture and composition. Eight species of plants representing six families were grown in the plats, namely, rice, soy beans, bush beans, radishes, sunflowers, sweet cassava, sugar cane, and pineapples.

The results showed that "the growths of bush beans and radishes were unaffected even by 35 per cent of $CaCO_3$. The growths of sunflowers, soy beans, and sugar cane were somewhat depressed by 18 per cent of $CaCO_3$; the growth of sweet cassava was somewhat depressed by 5 per cent of $CaCO_3$ and markedly by 35 per cent of $CaCO_3$; the growths of rice and pineapples were markedly depressed with the appearance of chlorosis, by 5, 18, and 35 per cent of $CaCO_3$.

"The carbonate of lime apparently had no effect on the amount of nitrogen, potash, and phosphoric acid contained in the various plants, but did increase slightly the total carbon-free ash in all the plants except rice, and modified either the amount of lime, magnesia, or iron in the ash of all the plants.

"On the calcareous soils the lime in the ash of bush beans was not increased, but there was a slight increase in the amount of lime in the ash of soy beans, sunflowers, and sugar cane. On the plat with 5 per cent of carbonate of lime, the lime in the ash of radishes was increased about 17 per cent, but on the plats with 18 and 35 per cent of carbonate of lime the increases of lime in the ash of this plant were progressively less. On the plat with 35 per cent of carbonate of lime the amount of lime in the ash and dry substance of sweet cassava was markedly increased. On all the calcareous soils the amount of lime in the ash and dry substance of rice and pineapples was greatly increased.

"Some plants whose growth was little affected by the carbonate of lime (bush beans, soy beans, radishes, and sunflowers) showed marked decreases in the amount of iron or noticeable decreases in the amount of magnesia in the ash, when grown on the calcareous soils.

"The plants whose growths were most depressed on the calcareous soils (rice and pineapples) showed the greatest increases in the amount of lime in the ash and dry substance of the plant, and also a marked decrease in the amount of iron in the ash."

Apparently the most significant changes in the composition of the ash of the plants showing the greatest injury from the calcareous soils were an increase in lime and a decrease in iron. The results, however, "do not warrant a decisive conclusion that the diminished growth of all those plants which are affected by the carbonate of lime is due to the same change in ash composition. In fact, some quite marked changes in ash composition, as the decrease of iron in bush beans, occurred without affecting the growth. And some depressions in growth occurred, as [in case of] sugar cane, with practically no change in ash composition."

Sulphur in plant nutrition (*Wisconsin Sta. Bul. 240 (1914), pp. 18, 19, fig. 1*).—A brief note is given on pot experiments in which W. H. Peterson found that where no sulphate had been applied the plants contained absolutely no circulating sulphates. On the other hand, clover on soil which had been supplied with gypsum contained an abundance of sulphates in the sap. "This suggests that the determination of the amount of sulphates in growing plants may be of value in showing whether or not a crop on a given soil is being limited in growth by a scarcity of sulphates."

In a study of the form and distribution of sulphur in crops it was found that such plants as June grass and red clover contained volatile sulphur compounds, as is known to be the case with plants of the mustard family.

Forms of sulphur in plant materials and their variation with the soil supply, W. H. Peterson (*Jour. Amer. Chem. Soc., 36 (1914), No. 6, pp. 1290–1300; abs. in Jour. Chem. Soc. [London], 106 (1914), No. 624, I, p. 914*).—This is a more complete account of investigations briefly noted above. It reports in detail the results of determinations of volatile sulphur, sulphates, soluble nonoxidized sulphur, and insoluble nonoxidized sulphur in ruta-bagas, cabbage, sugar beet, alfalfa, rape, radishes, clover, June grass, milk, oats, and wheat.

The method used in determining the volatile sulphur in plants was in brief as follows: Dry the material at 95 to 100° C. in a tube through which purified air is drawn; lead the gases over heated copper oxid and into an absorption bottle containing glass beads and a concentrated solution of potassium hydroxid; when this operation is completed boil the copper oxid in water to dissolve the copper sulphate formed; combine the solution in the absorption bottle with the washings from the copper oxid and concentrate the mixture on the water bath; cool and carefully neutralize with hydrochloric acid; pour the neutral solution slowly into bromin water; heat the oxidized sulphates; and precipitate the resulting sulphates with barium chlorid.

It was found that when only small quantities of sulphur were present in the material it was all fixed as copper sulphate. In case of ruta-bagas and cabbage the volatile sulphur amounted to about 10 per cent of the total sulphur. In case of radishes and clover grown in the greenhouse, the amount present depended upon the supply of sulphates in the soil, being four times as great with an abundant supply of sulphates in the soil as without. A considerable proportion (10 to 20 per cent) of the volatile sulphur in ruta-bagas was lost on drying the green material in the steam oven.

"Volatile sulphur was obtained from red clover, alfalfa, June grass, and sugar beet tops not known to contain any bodies yielding such compounds. The volatile sulphur in milk was also determined. The nature of this compound is not known. In ruta-bagas it is evidently of a sulphid form, as silver sulphid is obtained when silver nitrate is added to the distillate from ruta-bagas.

"The sulphates in the field samples examined varied from 10 to 50 per cent. Where large quantities of sulphates were added to the soil, there was a corresponding increase of sulphates in the plant tissue. Rape, radishes, and clover

grown in the greenhouse on soils low in sulphur, but supplied with an abundance of nitrogen, phosphorus, and potassium contained no sulphates.

"Where no sulphates were added to the soil, 90 per cent or more of the total sulphur was found in the form of unoxidized sulphur, probably in proteins. In the normally grown plants examined this was from 50 to 65 per cent of the total. The plant was evidently very economical of its supply and made healthy, vigorous growth where no sulphates could be found in the tissue."

A bibliography of 24 references to literature on the subject is given.

Some soil changes produced by micro-organisms, W. G. SACKETT (*Colorado Sta. Bul. 196 (1914), pp. 3–39, pls. 3*).—This is a popular discussion of the nature and activities of soil bacteria, yeasts, and molds, with particular reference to the decomposition of organic matter, the transformation of carbon and nitrogen, and the changes in mineral substances. The most space is devoted to the trasformation of nitrogen, under which are discussed ammonification, nitrification, denitrification, and symbiotic and nonsymbiotic fixation of atmospheric nitrogen. In this connection data previously reported (E. S. R., 30, p. 818) are reviewed.

Ammonification and nitrification studies of certain types of Oregon soils, T. D. BECKWITH, A. F. VASS, and R. H. ROBINSON (*Oregon Sta. Bul. 118 (1914), pp. 40. figs. 30*).—This bulletin reports a study of the number and kinds of bacteria in certain widely different types of Oregon soils and of the effect of moisture, soil acidity, and lime upon the numbers and activities of these organisms, an attempt being made especially to correlate the number of bacteria present in the soil and the amounts of ammonia and nitrate nitrogen produced.

The soils used were of two main groups, namely, those of western Oregon which are generally acid and deficient in lime and those of eastern Oregon which are neutral or slightly alkaline and abundantly supplied with lime. It was found that the number of bacteria in soils low in organic matter was small as compared with the number in peat and muck soils. The application of lime was without effect upon the number of bacteria except in acid soils or when large amounts of organic matter were added. There was a direct correlation between amounts of ammonia formed and the number of bacteria.

The ammonifying and nitrifying powers of the soils of western Oregon were favorably influenced by the application of lime. The ammonifying powers of the soils varied greatly, the light soils producing the greatest amount of ammonia when nitrogenous substances were added.

The unit ammonifying power of the organism also varied greatly, the organisms in some types of soils being much more active than those in others. It was found that the greater the number of bacteria to a gram of soil the less the amount of ammonia produced per unit number.

On the influence of soils and of the water content on nitrogen changes, W. P. ROBSON (*Über den Einfluss der Böden und des Wassergehaltes auf die Stickstoffumsetzungen. Inaug. Diss., Univ. Halle-Wittenberg, 1913, pp. 91*).—Studies were made of changes in nitrogen compounds in the natural organic matter of soils and in ammonium sulphate and horn meal in sandy loam and clay soils with varying amounts of water (6, 12, and 18 per cent in sandy soil; 8, 16, and 24 per cent in loam, and 8, 18, and 28 per cent in clay). The effect of the addition of sulphur on these changes was also studied.

With low moisture content the transformation of organic nitrogen was more rapid in sandy soils than in the heavy soils, while with higher moisture content there was very little difference. In all cases the nitrification of ammonium sulphate was more rapid the higher the water content. In sandy soils 97 per cent and in loam and clay soils 100 per cent of the ammonium sulphate applied had been transformed into nitrate at the end of the experiment. In the sandy soils

the nitrification of organic nitrogen was at first more rapid than that of ammonium sulphate. In general, the most rapid nitrification was observed in all soils between the third and the sixth week after the addition of ammonium sulphate. Only in the case of the clay soil with the highest moisture content was the most rapid nitrification observed during the first three weeks. Appreciable denitrification was observed without the addition of organic matter only with the highest water content. Ammonium sulphate in loam soil showed a loss of 19.8 per cent of the applied nitrogen at the end of the experiment. With horn meal furnishing an abundant supply of carbonaceous food there was a greater loss (32.2 per cent in loam and 32.7 per cent in clay soils) in the heavier soils but a very small loss in sandy soils (9 per cent).

The addition of organic matter, as for example in the form of sugar, reduced the amount of soluble nitrogen compounds in the soil. In all soils the addition of sugar increased this fixation of ammonium sulphate nitrogen but did not affect the nitrate nitrogen. The amount of nitrogen fixed was increased by the addition of sugar from 18.18 to 26.18 per cent in sandy soils, from 22.32 to 43.2 per cent in loam soils, and from 29.08 to 38.38 per cent in clay soils.

The danger of bacterial destruction of nitrate in the field, H. Fischer (*Fühling's Landw. Ztg., 63 (1914), No. 7, pp. 244–252*).—Reviewing various investigations on this subject, the author concludes that under normal conditions, particularly of drainage and aeration, the danger of denitrification in the field is not great.

Hurtful actors on cultivated plants, T. Jamieson (*Agr. Research Assoc. [Scot.] Rpt. 1913, pp. 15–37*).—Summarizing the results of experiments on the subject, the author concludes that the increased productiveness following the heating of the soil or treatment with substances inimical to life is "due simply to the riddance, in varied degree, of the varied forms of animal life in soil that prey on plants," and not to any influence upon the bacterial activity of the soil.

Barren spots, A. Hutin (*Bul. Assoc. Chim. Sucr. et Distill., 31 (1914), No. 12, pp. 968–978*).—A study of the causes of barren spots in sugar cane fields is reported.

Faulty soil aeration due to various causes is indicated as at least partly responsible for barrenness in certain cases. A study of the organic matter of certain of the barren soils which were apparently greatly benefited by liming showed the presence of a very large amount of soluble organic matter of a mucilaginous nature (pectates and parapectates). It is suggested that the unproductive character of the soil in such cases may be due to faulty aeration resulting from the presence of excessive amounts of the organic matter, and that liming coagulates this matter and thereby improves the aeration and drainage of the soil.

The fertility of the soil, M. F. Miller (*Missouri Sta. Circ. 69 (1914), pp. 19, figs. 3*).—This is a popular discussion of the problem and means of maintaining soil fertility, particularly under Missouri conditions. Emphasis is laid upon the fact that under present methods of management Missouri soils are not, on the whole, maintaining their fertility. It is pointed out that the extensive agriculture which prevails does not lend itself well to the profitable use of large quantities of commercial fertilizers. They can not be depended upon alone to maintain soil fertility and should therefore be used only in connection with good systems of crop rotation, manuring, and legume growing.

Fertilizer experiments (*Verslag. en Meded. Dir. Landb. Dept. Landb., Nijv. en Handel, No. 3 (1914), pp. 1–39*).—The results of a number of fertilizer experiments completed during the years 1910 to 1912 at different Dutch experiment stations are briefly reported.

In comparative tests of stable manure, a complete fertilizer, and a half and half mixture of the two, on different soils with different crops the best results generally were obtained with the complete fertilizer, followed closely by the half and half mixture. In comparative tests of sodium nitrate, ammonium sulphate, lime nitrogen, and calcium nitrate on alluvial, sand, and clay soils sodium nitrate and ammonium sulphate were apparently on the average about equally as good sources of nitrogen for potatoes, and were followed in order by calcium nitrate and lime nitrogen. Sodium nitrate was on the average the best for grains and sugar beets, followed in order by ammonium sulphate, lime nitrogen, and calcium nitrate. Ammonium sulphate was better than sodium nitrate for potatoes on sandy and alluvial soils, as was also calcium nitrate on sandy soils. Further tests of sodium nitrate and ammonium sulphate showed the former to be generally better for potatoes and the latter better for oats and rye, although the differences were on the average small. Castor-bean meal was not as desirable for potatoes, oats, and rye as were sodium nitrate and ammonium sulphate.

Potash fertilizers were, on the whole, used with profit on clay soil for potatoes, particularly when applied by means of a seeder or planter. In experiments to determine the best manner of potash fertilization on sand and peat soils equally good results were obtained with kainit and a patented artificial potash fertilizer as regards crop yield when applied in the spring or in the fall. The quality of potatoes was poorer, however, in some cases where kainit was applied in the spring. Both fertilizers were used with profit on clay soil with potatoes and sugar beets, and the favorable effects on the average increased with the application to a certain limit. In further experiments with potatoes and grain there was little difference in the results obtained with the two types of potash fertilizers, each being used with some benefit. The experiments as a whole indicate that kainit may be used with some benefit for potatoes and grain on peat soils, even when applied in the spring shortly before planting.

Tests of a potassium silicate containing 25 per cent clay, 50 per cent silica, 8 per cent sodium, and 9 to 10 per cent potash, using kainit, potassium chlorid, and a patented artificial potash fertilizer for comparison, showed that although the yield of potatoes was increased the potash of the potassium silicate was much less available than that of the other potash fertilizers.

Six years' tests of slag meal, superphosphate, bone meal, and Algerian phosphate on a new alluvial soil indicated that the superphosphate was the most desirable for oats, slag meal for rye, and bone meal and Algerian phosphate for potatoes. Two years' tests on a sand soil of superphosphate, agricultural phosphate, Bernard phosphate, and slag meal favored the superphosphate for potatoes and oats, while the two new phosphorus fertilizers were better for oats and poorer for potatoes than the slag meal. A comparison of slag meal and Bernard phosphate showed the former to be the more favorable for rye. Two years' tests on sand soil of slag meal, agricultural phosphate, bone meal, and superphosphate showed the superphosphate to be the least favorable for peas and beets, slag meal the most favorable for peas, and bone meal the most favorable for beets. Slag meal was the most favorable for potatoes on sand soil and superphosphate the least favorable.

On a heavy clay soil 8 years' liming experiments, using crushed limestone, marl, and burnt lime, gave favorable results with sugar beets, potatoes, oats, clover, mangel-wurzels, and onions.

Fertilizer experiments, M. VAN DEN BURGT ET AL. (*Verslag Rijkstuinbouwproefvelden Zuid-Gelderland en Utrecht, 1913, pp. 1–40*).—Cooperative fertilizer experiments with different crops on farms in various parts of Holland are briefly reported.

Five years' fertilizer experiments in East Prussia, A. STUTZER ET AL. (*Arb. Deut. Landw. Gesell., No. 258 (1914), pp. IV+236; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 7, pp. 873, 874*).—In cooperative fertilizer experiments made during the years 1909 to 1913 on farms in different parts of East Prussia it was found that 40 per cent potash salt was better than kainit as a winter top-dressing, and that potash was especially necessary on permanent pastures and meadows.

The results indicate that small applications of nitrogen may be beneficial to grass lands, but are not conclusive as to the conditions under which this is the case. Calcium nitrate proved to be a very effective source of nitrogen. Cyanamid was considerably inferior to sodium or calcium nitrates. The ease of application and efficiency of the cyanamid was increased by mixing it with ground bog iron ore, which assists in the transformation of the cyanamid into urea. Cyanamid freed from carbid by treatment with steam gave higher yields of oats than ordinary cyanamid. A mixture of ammonium sulphate and salt gave better results with sugar beets than sodium nitrate in a good season but poorer results in a bad (dry) year. Urea obtained from atmospheric nitrogen and urea nitrate gave good results in field and pot experiments, the recovery of nitrogen by oats being higher for these substances than for sodium nitrate. In case of tobacco urea nitrate was the most effective nitrogenous fertilizer used. Calcium nitrite, aluminum nitrogen, and silicon nitrogen, all atmospheric nitrogen compounds, were of little or no value as fertilizers.

The stimulating or catalytic effect of various metallic oxids and salts of metals was studied with inconclusive results.

The action of mineral fertilizers on the activity of certain soil bacteria, C. LUMIA (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 23 (1914), I, No. 9, pp. 738–746; abs. in Chem. Zentbl., 1914, II, No. 3, p. 261; Jour. Soc. Chem. Indus., 33 (1914), No. 14, p. 759*).—It was found that the alcoholic ferment remained practically inactive in culture media deficient in phosphoric acid and potash. Various phosphates, especially Thomas slag, promoted the activity of the ferment, but perphosphate checked it on account of the free sulphuric acid present. This retarding effect was overcome by adding calcium carbonate. Potassium sulphate and chlorid were almost as effective as phosphates in promoting the activity of the ferment, but leucite was without effect.

The author suggests that the behavior of the bacteria indicated in these results may be used as a means of differentiating between easily assimilable and difficultly assimilable fertilizers. See also a previous note (E. S. R., 31, p. 27).

Radio-active fertilizers, J. STOKLASA (*Chem. Ztg., 38 (1914), No. 79, pp. 841–844*).—Tests of the effect of radium emanations on bacteria, germinating seeds, and various crops are reported.

It was found that treatment with the radium emanations increased fixation of nitrogen by bacteria, promoted germination of seeds, and increased the growth of plants to a marked extent. A chemical analysis and pot test of a so-called radioactive fertilizer indicated that whatever fertilizing value this material may possess is not due to its radio-active properties.

The bacterial treatment of peat, W. B. BOTTOMLEY (*Bot. Jour. [London], 3 (1914), No. 2, pp. 49–53*).—A brief account is given of the author's method of treating peat to make it more active as a fertilizer and as a medium for the growth of Azotobacter. The results of tests of the material with various garden crops are also reported. These results indicated "that bacterized peat, in addition to being an excellent medium for the growth and distribution of nitrogen-fixing bacteria, possessed special manurial properties of its own."

See also a previous note (E. S. R., 30, p. 721).

Experiments with bacterized peat (*Gard. Chron., 3. ser., 56 (1914), No. 1436, pp. 12–14*).—A brief preliminary account is given of tests of this material in the open ground and in greenhouse experiments.

The results are stated to indicate that while the bacterized peat does not appear to have a beneficial effect upon the water-holding capacity of the soil it has valuable fertilizing properties which apparently are not limited to providing nitrogen. It gave the best results, as compared with manure, when used under conditions of an abundant supply of moisture.

On the influence of straw on the availability of organically combined nitrogenous fertilizers, F. von May (*Mitt. Landw. Lehrkanz. K. K. Hochsch. Bodenkul. Wien, 2 (1914), No. 3, pp. 433–454*).—In this paper previous literature along this line is briefly reviewed and results of experiments by the author are given in which rye straw, red clover hay, and cotton-seed meal were used as fertilizers for potatoes.

The potatoes were planted immediately after plowing under the fertilizing materials, singly and in combinations. The results showed that the availability of the organically combined nitrogen was depressed by the presence of a nitrogen-free organic substance (as in case of rye straw). The magnitude of this depression seemed to depend upon the relation of the nitrogen and nitrogen-free organic substance.

The author suggests that the depression of available nitrogen under these circumstances is due to appropriation of the soluble nitrogen by micro-organisms which use the nitrogen-free substance as a source of energy.

Experiments on the fertilizing action of guanidin and urea nitrates in comparison with sodium and ammonium nitrates, P. Wagner (*Mitt. Deut. Landw. Gesell., 29 (1914), No. 29, pp. 417–421*).—In pot experiments with oats and rye grass, urea and guanidin nitrates were less effective fertilizers than ammonium or sodium nitrates. With oats the guadinin nitrate was positively injurious.

The conversion of ammonia into nitric acid or ammonium nitrate from an economic standpoint, O. Dieffenbach (*Chem. Indus., [Berlin], 37 (1914), No. 10, pp. 265–269; abs. in Jour. Soc. Chem. Indus., 33 (1914), No. 11, p. 590; Chem. Ztg., 38 (1914), No. 77, Repert., pp. 360, 361*).—It is concluded that the conversion of ammonia into nitric acid and ammonium nitrate is likely to be less profitable than conversion into sulphate except in factories producing calcium nitrate as a fertilizer from synthetic nitric acid. In this case the absorption of ammonia by nitric acid is shown to be more economical than by sulphuric acid, and it is suggested that the production of ammonia from calcium cyanamid or aluminum nitrid can be profitably combined with the manufacture of nitric acid by the Birkeland-Eyde process.

The fixation of atmospheric nitrogen, J. Knox (*London, 1914, pp. VII+112, figs. 7*).—This is the fourth of a series of chemical monographs intended primarily for advanced students. It deals with theories of methods of (1) fixation of atmospheric nitrogen as nitric and nitrous acids, or as their salts, (2) synthesis of ammonia and ammonium compounds from atmospheric nitrogen, and (3) conversion of atmospheric nitrogen into compounds which readily yield ammonia. Attention is given only "to those methods which are either in actual operation, or which show promise of assuming technical importance in the near future." Information regarding the purely technical part of the subject is drawn from the report of Norton (E. S. R., 27, p. 623).

A bibliography of 153 references to the literature of the subject is given.

Lime nitrogen-superphosphate, H. Koppen (*Illus. Landw. Ztg., 34 (1914), No. 18, pp. 181, 182; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 5, pp. 629, 630*).—Experiments are reported

which indicate that mixing lime nitrogen with superphosphate does not decrease the availability of the nitrogen but causes a decided reversion of soluble phosphoric acid. The author, therefore, advises against the use of mixtures of cyanamid and superphosphate.

Available phosphates by furnace treatment, J. H. PAYNE (*Amer. Fert., 41 (1914), No. 7, pp. 44–46*).—Various processes proposed for obtaining available phosphoric acid by heat treatment of phosphate rock are briefly described. The prospect of successful commercial use of some of these processes is thought to be good.

Availability of phosphate to various crops (*Wisconsin Sta. Bul. 240 (1914), pp. 22, 23, fig. 1*).—In experiments which are here briefly noted, E. Truog found in a comparison of ten different kinds of plants grown under greenhouse conditions with acid phosphate, rock phosphate, precipitated calcium phosphate, aluminum phosphate, iron phosphate (both ferric and ferrous), magnesium phosphate, or manganese phosphate as sources of phosphorus that "contrary to the general belief that aluminum and iron phosphates are relatively unavailable to plants, nine of the ten plants tested made better growth on aluminum phosphate than on calcium phosphate, and six better growth on iron (ferric) phosphate." This clearly indicates the inadequacy of chemical solvents as means of determining the availability of different phosphates.

Notes on kelp and its potash contents, G. SURR (*Mining and Engin. World, 38 (1913), No. 10, p. 488*).—An analysis of *Macrocystis pyrifera* showing 1.65 per cent of potash in the fresh plant (87.02 per cent of water) is reported and the fertilizing value and commercial possibilities of kelp are discussed.

Commercial fertilizers and their use, G. S. FRAPS (*Texas Sta. Bul. 167 (1914), pp. 3–45*).—This is a popular discussion of the subject, dealing particularly with the plant food requirements of different crops and how fertilizers supply these requirements, the principal sources and nature of fertilizing materials, the preparation of fertilizers, the valuation and purchase of fertilizers, methods of experimenting with fertilizers, and methods of using fertilizers on different crops and soils, particularly those of Texas.

Chemical analyses of licensed commercial fertilizers, 1913, F. W. WOLL and W. H. STROWD (*Wisconsin Sta. Circ. 49 (1914), pp. 17, fig. 1*).—Guarantied and actual analyses of fertilizers, including ground limestone and rock phosphate, offered for sale in Wisconsin during the year are reported and discussed.

AGRICULTURAL BOTANY.

Spore conditions in hybrids and the mutation hypothesis of De Vries, E. C. JEFFREY (*Bot. Gaz., 58 (1914), No. 4, pp. 322–336, pls. 4*).—The author reports examining a large number of spore-bearing plants as well as numerous higher plants, and found that spontaneous hybridization, while comparatively rare among lower plants, is very common among the angiosperms. In such families as the Rosaceæ and the Onagraceæ there are found to be grading into each other recognized species and recognized hybrids, having in common the character of partial or complete reproductive sterility, which is easily recognized in the organization of the pollen. This is said to point to the hybrid origin of these abnormal species. Species of this type, the author proposes, should be called crypthybrids and include species of Œnothera, many species of Epilobium, and probably those of Fuchsia. This addition, it is claimed, must be recognized in connection with any investigation on the origin of species based on such material as *Œ. lamarckiana*, *Œ. biennis*, etc.

In conclusion the author states that although there appears to be good evidence that hybridism has been an important cause of the multiplication of species, there seems to be no logical support for the view that it has to do with their actual origin.

Some wild tuberiferous Solanums, L. WITTMACK (*Ber. Deut. Bot. Gesell., 31 (1913), Gen. Versamml. Heft, pp. (10)–(34), figs. 4*).—Descriptions and illustrations are given of several specimens of Solanum sent to the author for study following the appearance of his articles, formerly noted (E. S. R., 31, p. 425), also a proposed systematic arrangement of several forms with reference to the views in this connection of several other authors.

The relationship between the weight of the seed planted and the characteristics of the plant produced, II, J. A. HARRIS (*Biometrika, 10 (1914), No. 1, pp. 72–84, figs. 4*).—In continuation of investigations previously reported (E. S. R., 29, p. 522), the author reports on the constants measuring the influence of the weight of the seed planted upon the number of ovules formed and the number of seeds developing in the pods of mature plants of *Phaseolus vulgaris*.

There was found to be a sensible relationship between the weight of the seed planted and the number of pods on the plant developing from it. There was also a positive correlation between the weight of the seed planted and the number of ovules and the number of seeds in the pods produced. The correlations between weight and ovules and weight and seeds are said to be regarded as the resultant of two other correlations, namely, that between the weight of the seed planted and the number of pods per plant and that between the number of pods on the plant and the characteristics of these pods.

The conservation of vitality of seeds in soil periodically cultivated, O. MUNERATI and T. V. ZAPPAROLI (*Staz. Sper. Agr. Ital., 46 (1913), No. 5, pp. 347–371, fig. 1*).—Experiments carried out with seeds of about 18 species of common plants, buried at various depths up to 45 cm. in soil and examined at varying intervals, are claimed to show that seeds of many cultivated or wild plants having coverings more or less permeable by water show a power of conserving vitality when buried in soil that is in close relation to their germinability at the time when they are planted.

Effects of disinfectants on germinability of grain, A. FRASSI (*Staz. Sper. Agr. Ital., 46 (1913), No. 1, pp. 25–56*).—Germination tests were made with wheat seed after exposure to the action of different disinfectants in solution or in gaseous form during periods of varying length. The results given in connection with each test show the various degrees of injury inflicted, which is generally greater in case of moistened seeds than of those exposed only to vapors, and still greater in case of seeds in solutions, length of time always playing an important part. A bibliography is appended.

Delayed germination in seed of Alisma plantago, W. CROCKER and W. E. DAVIS (*Bot. Gaz., 58 (1914), No. 4, pp. 285–321, figs. 8*).—A study is reported of the delayed germination of the water plantain, which is said to be due to the mechanical resistance of the seed coat. The seed coat was found to be composed almost entirely of pectic substances, which acids and bases so weakened that imbibitional and osmotic swelling of the embryo was capable of breaking away the coat cap. The authors state that the seeds of Alisma, as well as water plants in general, are capable of lying in water for years in an imbibed condition without losing their vitality.

A bibliography is appended.

Vegetation experiments on the evaporation of pine seedlings, A. TOL'SKĬĬ (*Abs. in Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 13 (1912), No. 4, pp. 651, 652*).—The author describes the method and gives the results of his investigations conducted during several years with reference to the amount of

moisture given off by pine seedlings at the age of one to three years and to the influence of the weather on their evaporation.

To determine the limits of the fluctuations in the amount of evaporation by the seedlings in strict relation to age, in case of plants in vessels watered daily, proved impossible since only year-old plants gave more or less homogeneous magnitudes, while in the case of plants two and three years old the fluctuations in the evaporation by individual pines were very considerable. The evaporation considerably increases as the young needles attain normal dimensions, but before the needles develop the evaporation is feeble even at high temperatures. The pines were found to evaporate in the spring considerably less than in corresponding weather toward the end of the summer of the preceding year, and this continues to be noticeable until the new young shoots complete their development.

In an experiment with gradually decreasing humidity of the soil, when the pots were watered from two to five times during the summer it was found that the seedlings which were watered and those which were not watered dried the soil to a like degree nearly to the limit of minimum capacity for humidity; also that the introduction of water into the soil caused a large rise in the evaporation in young birches, while in pines the growth and evaporation were affected only by the first watering in the beginning of the spring, watering in the summer only slightly increasing the evaporation. The last mentioned fact is explained by the development of the pine being completed by the middle of the summer, in consequence whereof the water supplied later goes only to maintain the life activity of the developed needles. In young birches, on the other hand, each watering induces the appearance of new leaves with a consequent new increase of evaporation.

As to the influence of the weather on evaporation, the importance of the temperature and solar radiation was accentuated. Observations on the course of the daily evaporation in clear days showed the existence of two maxima, the larger before midday and the other after midday.

The effects of surface films on the rate of transpiration: Experiments with potted potatoes, B. M. Duggar and J. S. Cooley (*Ann. Missouri Bot. Gard., 1 (1914), No. 3, pp. 351–356, pl. 1*).—In a previous report (E. S. R., 30, p. 726) the authors presented data concerning the application of a film of Bordeaux mixture to the leaves of castor bean and tomatoes. In the present paper experiments have been extended to potatoes to determine the effect of sprays upon the transpiration of this plant. Potted potatoes in good growing condition were arranged in series of 10 plants each, the different series receiving strong Bordeaux mixture, weak Bordeaux mixture, lime wash, lime-sulphur solution, strong Bordeaux mixture and lampblack, and lime wash and lampblack. The water loss from the different plants was determined for 5-day periods.

The results obtained corroborated those previously announced, showing that there was a marked acceleration of transpiration induced by spraying with Bordeaux mixture, as also with some other films. The experiments not only indicate that Bordeaux mixture facilitates water loss, but that treatment with a fairly thick lime wash or lime wash and lampblack also increases transpiration. Lampblack added to Bordeaux mixture seemed to give a greater transpiration than Bordeaux mixture alone. This seems to indicate that the additional quality of color is a factor requiring investigation. The fact that injury might result from the accelerated transpiration under the conditions of the experiment does not indicate that a benefit might not accrue under field conditions.

On the formation of hydrocyanic acid in plants, A. JORISSEN (*Acad. Roy. Belg., Bul. Cl. Sci., No. 3 (1914), pp. 130–137; abs. in Nature [London], 94 (1914), No. 2340, p. 7*).—Attention is called to the fact that citric acid in the presence of oxidizing agents and a trace of nitrate gives rise to hydrocyanic acid, and that in dilute solution in sunlight small quantities of ferrous or ferric salts can bring about the preliminary oxidation of the citric acid. As citric acid is widely distributed in plants, the author considers that hydrocyanic acid may possibly be produced in them through the action of sunlight on citric acid in the presence of traces of iron salts.

The oxidases of acid tissues, G. B. REED (*Bot. Gaz., 57 (1914), No. 6, pp. 528–530*).—Results of work done by the author are said to suggest that the apparent absence of oxidases in some organisms as reported by some authors may be due to faulty methods of observation. Having obtained results comparable with those reported by Clark (E. S. R., 30, p. 203), who noted a relation between apparent absence of oxidases and acid reaction, the author made special tests with citrus fruits, from which it appeared that these have normal oxidases in their acid tissues, also that these oxidases are protected in some manner from the action of the acid, which at the usual concentration inhibits the action of the oxidases.

The author thinks this protection may be afforded by a semipermeable surface (plasma membrane or cell walls similar to the cell walls of barley seed), through which the acid is unable to pass. When the tissue is ground, previous to expressing the juice, the structure which separates the acid from the ferment is destroyed so that the action of the latter is inhibited. It is thought probable that this condition is a general one in acid tissues. The general effects of acids and alkalis on oxidase ferments are now under investigation.

Some accessory factors in plant growth and nutrition, W. B. BOTTOMLEY (*Proc. Roy. Soc. [London], Ser. B, 88 (1914), No. B 602, pp. 237–247, figs. 2*).—Experiments are reported in which the manurial value of sphagnum peat which had been incubated with a mixed culture of aerobic soil organisms was tested. The results obtained indicated that the growth-stimulating action of the bacterized peat might be due to the presence of a substance or substances similar in nature to the accessory food bodies concerned in animal nutrition.

In another series of experiments extracts of bacterized peat were tested on the growth and fixation of nitrogen by *Azotobacter chroococcum*, and the results obtained indicated that there is present a substance which stimulates plant growth, and that it is of a fairly stable nature. Further investigations showed that this active stimulant could not be obtained directly from raw peat, but was evidently the result of bacterial action.

In another series of experiments a solution was tested on wheat seedlings deprived of their endosperms, but furnished with a nutrient solution and the same solution containing the extract from peat. After 17 days the weights of the plants were obtained, showing a decided increase where the bacterized peat solution has been employed.

Bioreactions of tellurium and their applicability to the study of vegetable physiology and pathology, G. POLLACCI (*Atti Ist. Bot. R. Univ. Pavia, 2. ser., 15 (1914), pp. 281–284, fig. 1*).—This is a brief report on the effects produced by tellurium on plants and their parasites, as shown by experiments with roots of Brassica attacked by *Plasmodiophora brassicæ*. The effects produced when these were kept 48 hours in a solution containing a very small proportion of a tellurium salt indicate that this fungus is able to reduce the salt.

The effect of the soot in smoke on vegetation, J. F. CLEVENGER (*Mellon Inst. Indus. Research, Smoke Invest. Bul. 7 (1913), pp. 26, pls. 8, figs. 2*).—The results are given of an investigation to determine the effect of soot in smoke

and other included materials upon plants, the observations being made in the public parks of Chicago, in Pittsburgh and vicinity, along the railroad between Tyrone and Pittsburgh, and at State College, Pa., the work being carried on cooperatively between the botanical department of the Pennsylvania State College and the Institute of Industrial Research.

The experiments show that especially in the case of pines, when soot is applied in small quantities over a considerable interval of time measurable injury follows. The soot is found to be a mixture of finely divided carbon, ash, tar, and gases, which may have a mechanical effect and also cause injury through their chemical properties. The injury done by soot is considered chiefly due to the accompanying ash, tar, and gases. Of the gases, sulphur dioxid and sulphur trioxid were said to cause considerable injury to vegetation.

The injurious effects of tarring roads on neighboring plants and remedies therefor, C. L. GATIN (*1. Cong. Internat. Pathol. Comparée [Paris], 1912, vol. 2, Comp. Rend., pp. 914–924*).—This work has already been partly reported (E. S. R., 27, p. 333). Strong insolation is said to favor injury to plants by gases from tarred roads, while frequent rains or strong winds decrease its severity.

Bacterial digestion of fiber or cellulose (*Wisconsin Sta. Bul. 240 (1914), pp. 21, 22, fig. 1*).—In an investigation conducted by R. R. Primm, a method was perfected whereby bacteria capable of digesting fiber or cellulose are readily isolated and studied. It is claimed that bacteria have been isolated which actively digest cellulose at a temperature of 149° F., and that they have been kept in pure cultures for a number of generations at this temperature without the loss of their cellulose digesting power.

Influence of soil bacteria on plant growth (*Wisconsin Sta. Bul. 240 (1914), pp. 19–21, fig. 1*).—In a study of the injurious effect of certain soil compounds on plant growth, C. Hoffmann found that when pure cultures of various soil bacteria were grown in extracts from marsh soil in which corn, oats, or clover had been previously grown, the bacterial content was considerably increased. When, however, the organisms were grown in extracts from cropped loam or sandy soils, the bacterial development was retarded. The action of corn grown in such solutions was especially notable in its root development. It was also found that different kinds of bacteria behaved differently in previously sterilized soil, showing apparently that the resulting compounds of bacterial activity in soils have an important bearing on plant nutrition and that various crops stimulate or retard others through this means, as in crop rotation.

Physiological investigation of the respiration of denitrifying microorganisms, A. F. LEBEDEV (*Zap. Nov. Obshch. Yest., Vol. 39; abs. in Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 13 (1912), No. 4, pp. 632, 633*).—The process of denitrification was studied in the case of *Bacillus pyocyaneus* under anaerobic conditions.

The examination of the gaseous exchange in old cultures showed the ratio of carbon dioxid to nitrogen to be equal to the theoretical one or very near to it. Thus the denitrification process is a true respiratory process. However, in young cultures this ratio is always greater than the theoretical one, being in some cases even 1½ times as great.

A contribution to our knowledge of the relation of certain species of grass-green algæ to elementary nitrogen, J. R. SCHRAMM (*Ann. Missouri Bot. Gard., 1 (1914), No. 2, pp. 157–184, pl. 1, fig. 1*).—In the present series of experiments it was the author's aim to extend the observations over a greater variety of algal forms than has been dealt with heretofore in pure culture and under unexceptionable conditions. It is claimed that in seven forms named complete results have been obtained, none of these forms being able to fix free atmos-

pheric nitrogen in the complete absence of combined nitrogen under the conditions here employed.

Indications regarding the source of combined nitrogen for Ulva lactuca, G. L. FOSTER (*Ann. Missouri Bot. Gard., 1 (1914), No. 2, pp. 229–235*).—Working on the general question as to the sources of nitrogen for marine algæ, the author carried out some preliminary experiments to determine the sources of available nitrogen for *U. lactuca*.

From the growth and appearance of this alga in natural and in artificial sea water with ammonium, urea, acetamid, etc., it was found that the first two of these nitrogen sources named are considerably better nutrients for Ulva than the others, in either natural or artificial sea water. It is thought probable that Ulva is not limited to an inorganic nitrogen supply and that for this alga the amount of available nitrogen in the water is a limiting factor in growth.

Concerning a plurality of starches, C. TANRET (*Compt. Rend. Acad. Sci. [Paris], 158 (1914), No. 19, pp. 1353–1356*).—From a study of starches from oats, bananas, wheat, chestnuts, beans, lentils, maize, barley, peas, apples, rice, buckwheat, rye, and potatoes, the author claims to have found that they not only have different proportions of amylopectin and amylose, but that they react quite differently to physical and other agents, indicating that starches are not all alike.

FIELD CROPS.

The work of the Huntley reclamation project experiment farm in 1913, D. HANSEN (*U. S. Dept. Agr., Bur. Plant Indus., Work Huntley Expt. Farm, 1913, pp. 14, figs. 5*).—This describes the climatic and agricultural conditions of the Huntley, Mont., project and reports experimental work, which includes crop rotation, time and methods of planting alfalfa, time of harvesting alfalfa, tests of pasture grasses, variety tests of corn, irrigation of flax, fertilizer tests with wheat, oats, and barley, and test of orchard trees and small fruits, and pasturing corn and alfalfa with hogs.

"The chief results from the rotation experiments in 1913 are the following: Decidedly better yields were produced with crops grown in rotation than with the same crops grown continuously on the same land. The yields indicate that the practice of plowing under alfalfa and of applying barnyard manure greatly increases the productivity of the soil. The beneficial effect on the soil of growing cultivated crops, particularly sugar beets and potatoes, was strongly indicated."

The results of the time-of-cutting experiment "indicate that delaying the harvest of the first crop did not have the effect of reducing the yield of the second crop. There was, on the contrary, a consistent increase in the yield of the second crop as the growing period of the first crop increased. The yields obtained in 1913 indicate that three cuttings a year will be more profitable than four cuttings."

Of several methods employed in the reclamation of the Worden tract it is noted that "determinations of the total salt content of the soil indicate that the practice of plowing under rye as a green-manure crop has been more effective than either of the other methods in reducing the salt content. This method has also been found to be much less expensive."

The work of the Truckee-Carson reclamation project experiment farm in 1913, F. B. HEADLEY (*U. S. Dept. Agr., Bur. Plant Indus., Work Truckee-Carson Expt. Farm, 1913, pp. 1–8, 10, 11*).—These pages record the soil and climatic conditions at the Truckee-Carson experiment farm and include data showing acreage, yields, and farm values of crops grown on this project in 1913.

The results of various tests with alfalfa grown for soil-improvement and forage purposes as noted show Grimm, Peruvian, Western Grown, Caucasus, and Montana to have been the best five. Data show that three cuttings a year secure a larger yield than two cuttings, but the author concludes not sufficiently large to cover the expense of the third cutting. Irrigation experiments on a small scale showed weekly irrigations to be more productive with alfalfa than at two-, three-, four-, five- or six-week periods. It is noted, however, that these conclusions are drawn from only one year's work.

Various tests with potatoes showed Early Rose, Colorado, Mammoth Pearl, and Burbank to be the best yielders out of 12 varieties.

The cause of the spotted character and general nonproductivity of soils in portions of the project was found to be the presence of excessive alkali salts.

Forage and silage crops for Oklahoma, O. O. CHURCHILL (*Oklahoma Sta. Circ. 34 (1914), pp. 3–15, fig. 1*).—For Oklahoma conditions the following forage and silage crops are discussed: Bermuda, brome, Colorado, Sudan, and Johnson grasses, timothy, orchard grass, redtop, blue grass, fescue, curly mesquite, and native grasses, alfalfa, cowpea, sweet Japan, burr, medium red, mammoth, alsike, and white clovers, and vetches. As coarse fodders are mentioned grain sorghums, canes, corn, teosinte, pearl millet, millets, and rape, and as silage crops, grain crops, peanuts, alfalfa, cowpeas, corn, cane, and grain sorghums.

Grains and forage crops (*Wisconsin Sta. Bul. 240 (1914), pp. 26–30, figs. 4*).—This consists of brief notes referring to the work in progress by R. A. Moore and E. J. Delwich in regard to testing varieties, and breeding and selection of rye, wheat, soy beans, clover, and field and canning peas, and methods of curing seed corn at the station and elsewhere in the State.

Yields per acre of different classes of farm crops, C. A. ZAVITZ (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 39 (1913), pp. 120–188, figs. 6*).—Notes on the year's work as to the effect of change of seed, rotations, seed selection, plant selection and hybridization, cooperative experiments, oat smuts, and different combinations for grain productions, and variety tests of cereals, buckwheat, legumes, flax, millet, sunflowers, sorghum, potatoes, roots, sugar beets, rape, cow cabbage, and kale are reported.

[Field crop experiments], L. SMITH (*Rpt. Agr. Expt. Sta. St. Croix, 1912–13, pp. 4–39, 46–53, 60–65, 71, 72*).—Results of manurial, cultural, and variety tests are given with sugar cane, cotton, sweet potatoes, potatoes, maize, sorghum, Lyon beans, Canada beans, cowpeas, pigeon peas, horse beans, guar, woolly pyrol, Porto Rico beans, peanuts, spineless cactus, and analyses of cotton and some legumes.

[Manurial, variety, and cultural experiments], D. A. GILCHRIST (*County Northumb. Ed. Com. Guide to Expts. 1914, pp. 9–84, fig. 1*).—This gives some results of manurial treatments of meadows and pastures in terms of pounds of gain of cattle or sheep, and of variety tests with cereals and potatoes, mangels, cabbages, sugar beets, thousand-headed kale, swedes, and turnips.

Field experiments, 1913 (*Dept. Agr. and Tech. Instr. Ireland Jour., 14 (1914), No. 2, pp. 252–303*).—This paper gives results of variety tests of barley, potatoes, mangels, oats, turnips, and wheat, and manurial tests with barley, hay, pasture, potatoes, mangels, oats, and turnips which involved the use of nitrate of soda, superphosphates, kainit, basic slag, barnyard manure, liquid manure, sulphate of ammonia, muriate of potash, and seaweed and salt on both upland and peaty soils.

On peaty soils containing from 17.5 to 32.9 per cent organic matter and in preliminary experiments, each of the manurial applications (1) 1 cwt. nitrate of soda, 2 cwt. superphosphate, and 2 cwt. kainit per acre, (2) 1 cwt. nitrate of soda, 2 cwt. basic slag (high grade), and 2 cwt. kainit, and (3) one-half

cwt. nitrate of soda, 4 cwt. basic slag (high grade), and 2 cwt. kainit produced practically the same increase in yield of hay and at almost the same cost. In using seaweed for potatoes it was shown that "weight for weight, seaweed seldom produces as heavy a crop of potatoes as does farmyard manure; muriate of potash generally has less effect when used with seaweed than when applied with dung; seaweed gives the best results on light soils and, possibly, in a dry season."

In experiments with mangels the use of 20 tons of barnyard manure per acre was more profitable than a dressing of 15 tons. Adding 4 cwt. superphosphate resulted in an average profit of 6s. 6d. (about $1.58) per acre, while also adding 2 cwt. of sulphate of ammonia resulted in an average annual profit of 3s. 6d., and either 2 cwt. or 4 cwt. of kainit in annual profits of 16s. 6d.

Plant breeding in Sweden, H. H. NILSSON (*Jour. Heredity, 5 (1914), No. 7, pp. 281–296, figs. 7*).—This article describes the old method of "selection in mass" and the modern one of "pedigreed culture", and relates the achievement obtained at the Svalöf Institute in the production and introduction of improved strains of cereals, legumes, and forage plants and the influence of this work on plant breeding in general.

A study of root systems of plants in pure and in mixed seedings, C. KRAUS (*Fühling's Landw. Ztg., 63 (1914), Nos. 10, pp. 337–362, pls. 5; 11, pp. 369–383; 12, pp. 401–412*).—The author gives results of his study at Munich in regard to the length, size, volume, and spread of root systems of cereals and legumes planted in both field and pot cultures, in mixtures, and in single varieties.

It seems from these results that an intimate knowledge of the habits of growth of root systems of agricultural plants will greatly enable the grower to space plants to better advantage, and to sow such mixtures that the soil volume will have a better distribution of roots and thus allow of a more intensive method of cultivation.

Inoculation of legumes with special reference to high moorland, A. DENSCH (*Mitt. Ver. Förd. Moorkultur Deut. Reiche, 32 (1914), Nos. 10, pp. 237–245; 11, pp. 253–261*).—This reviews recent German literature on the subject.

Proceedings of the seventy-second meeting of the Central Moor Commission (*Protokoll Cent. Moor Com., 72 (1913), pp. IV+350, pls. 2, figs. 25*).—This gives the reports and discussions at the December, 1913, meeting of the commission covering the several moorland experiment stations throughout East Friesland.

Cultivation and management of moorland pastures and meadows, M. FLEISCHER (*Die Anlage und die Bewirtschaftung von Moorwiesen und Moorweiden. Berlin, 1913, 2. rev. ed., pp. VIII+132, figs. 41*).—A treatise covering 37 questions arising in connection with the cultivation of moorland pastures and meadows.

The seeding of meadows and pastures, C. B. HUTCHISON (*Missouri Sta. Circ. 68 (1914), pp. 259–265*).—This circular discusses the value and uses of nurse crops, timothy, red and alsike clovers, and orchard grass, and fertilizing meadows and pastures, and suggests several grass seed mixtures.

The favorable depth for grass seed, G. RICHTER (*Mitt. Ver. Förd Moorkultur Deut. Reiche, 32 (1914), No. 12, pp. 270–276*).—Results here reported show much better yields after harrowing and rolling than after rolling only.

Study on the ancient classification of cereals, J. and C. COTTE (*Etude sur les Blés de l'Antiquité Classique. Paris, 1912, pp. 99*).—This is a discussion of the ancient classification of cereals.

The application of a new method in variety tests of cereals, K. VON RÜMKER, R. LEIDNER, and J. ALEXANDROWITSCH (*Ztschr. Pflanzenzücht., 2*

(*1914*), *No. 2, pp. 189–232, figs. 5*).—This discusses a method previously applied to tests with stock beets (E. S. R., 31, p. 736), and now used in computing comparative values in cereal tests.

This method advocates the use of at least five check plats, and bases selection upon accurate numerical measurements of characters combined with careful biological observations. Its application is demonstrated in the results obtained in practical breeding experiments with several pure lines of wheat. The field experimental work and the mathematical calculations of these experiments are fully described.

Alfalfa (*Agr. Gaz. Canada, 1 (1914), No. 4, pp. 285–302, figs. 6*).—Cultural methods and tests of varieties of alfalfa grown are reported by J. B. Daggett for New Brunswick, L. S. Klinck and H. Nagant for Quebec, H. J. Moorhouse for Manitoba, S. E. Greenway and J. Bracksen for Saskatchewan, H. A. Craig for Alberta, and W. T. McDonald for British Columbia.

Strains of the Grimm variety are noted as being especially successful.

Alfalfa hybridization, W. Southworth (*Jour. Heredity, 5 (1914), No. 10, pp. 448–457, figs. 3*).—The results of several years of study and hybridization to improve alfalfa are summed up as follows:

"Alfalfa apparently does not seed freely in absence of suitable insects to insure fertilization of the the flowers. Wild bees of the Megachile species seem to be most effective in insuring fertilization. Alfalfa flowers are not self-sterile and may be artificially self-fertilized with good results. Black medick is capable of self-fertilization and produces seed freely even when insects are prevented gaining access to the flowers.

"In the practice of hybridization of alfalfa better results are obtained by working on mature flowers than by operating on flower buds. The cross between alfalfa and black medick is effected only with considerable difficulty and prolonged effort is essential to warrant success. In the F_1 generation hybrids the plants were variable and usually greatly different from either of the parental forms. A study of the progeny of F_2 generation revealed a tendency to mendelian segregation both in height of plant and habit of growth, but further study is necessary to confirm these points."

The farmers' alfalfa guide, J. R. M. Boyd (*Columbus, Ohio, 1914, pp. 47, figs. 7*).—A booklet of questions and answers covering alfalfa culture and based upon the author's experience.

Buckwheat, H. G. Mundy (*Rhodesia Agr. Jour., 11 (1914), No. 5, pp. 739–744, pl. 1*).—This article gives results of variety tests, including six selections of buckwheat in which the yield ranged from 664 to 2,048 lbs. per acre.

The effect of soil conditions on the tassels of maize, F. S. Harris (*Science, n. ser., 40 (1914), No. 1023, pp. 215, 216*).—From work carried on at the Utah Experiment Station to study the effect of soil factors on plants the author presents data on the corn plant to show that the number of branches per tassel is affected by the conditions of the soil and that there is a close relationship between the tassel branches and number of ears produced.

Tests made with nitrate fertilizers on maize, G. C. Dudgeon (*Agr. Jour. Egypt, 4 (1914), No. 1, pp. 55–60*).—This paper records results showing the general superiority of nitrate of soda over cyanamid or nitrate of lime in the production of maize in four different localities in Egypt.

Maize culture, A. H. E. McDonald (*Dept. Agr. N. S. Wales, Farmers' Bul. 78 (1914), pp. 3–88, figs. 38*).—Methods of production employed in New South Wales with the corn crop are reported.

Mechanical cotton plants, W. L. Balls (*Cairo Sci. Jour., 8 (1914), No. 93, pp. 135–137*).—This article discusses the value of curves derived from daily

records of growth and flowering of the cotton plant in forecasting the ripening of the cotton.

"Bolly cotton" (*Bur. of the Census [U. S.] Bul. 125 (1913), p. 10*).—This article notes the increased quantity on the market of "bollies" (cotton from partly opened bolls damaged by frost) due to devised machinery for handling this product, which was formerly considered a loss by the growers.

The work of the British Cotton Growing Association, J. A. HUTTON (*Brit. Cotton Growing Assoc. [Pub.], 57 (1914), pp. 72, pl. 1*).—This is a paper read at the Third International Congress of Tropical Agriculture, held in London in June, 1914.

Cowpeas and soy beans, W. L. NELSON, A. T. WIANCKO, M. L. FISHER, C. O. CROMER, and J. K. WRIGHT (*Missouri Bd. Agr. Mo. Bul., 12 (1914), No. 5, pp. 3–48, figs. 10*).—This bulletin contains articles upon the production and uses of cowpeas and soy beans by several authors, including the text of Indiana Station Bulletin 172 (E. S. R., 31, p. 37).

Esparto industry in Almeria Province, B. F. YOST (*Daily Cons. and Trade Rpts. [U. S.], 17 (1914), No. 165, pp. 306–308*).—This article describes esparto (*Stipa tenacissima*), its habitat, and the method of gathering and preparation, baling, etc., for shipment to Great Britain for the manufacture of paper pulp.

Guinea grass, H. O. JACOBSON (*Philippine Agr. Rev. [English Ed.], 7 (1914), No. 5, pp. 211–215*).—This article describes this grass (*Panicum maximum*) and gives its chemical composition and cultural methods. It is noted that yields at the Singalong Experiment Station in 1908 gave in four cuttings a total of 21,543 kg. from 0.3 hectare (about 32 tons per acre), the total growing period being 183 days.

Sexual studies of the hop plant, J. TOURNOIS (*Ann. Sci. Nat. Bot., 9. ser., 19 (1914), No. 2–3, pp. 49–191, pls. 5, figs. 23*).—A paper on the study of the flower and the differentiation of the sexual elements, the fertilization and formation of the embryo, and the formation and constitution of the fruit.

A bibliography of 80 titles is appended.

Kafir score card, A. H. WRIGHT (*Oklahoma Sta. Circ. 35 (1914), pp. 4*).—Score card with explanations of points for both head and grain exhibits is given.

Studies on oat breeding.—I, Variety tests, 1910–1913, F. M. SURFACE and C. W. BARBER (*Maine Sta. Bul. 229 (1914), pp. 137–192, figs. 8*).—This bulletin describes methods employed in the field work and in the keeping of records in variety tests with 34 varieties of oats covering the years 1910–1913 inclusive.

"Of the 11 varieties which have been tested for all four years the Irish Victor gave the best average yield (63.7 bu. per acre). The Imported Scotch, Lincoln, and Prosperity averaged to yield at nearly the same rate. The Senator, a horse-mane oat, with very coarse straw and large plump grains, gave the lowest average yield (49.3 bu.). A study of the variation constants (standard deviation and coefficient of variation) for the four-year period shows that the Victor (a black oat) and the Imported Scotch were by far the least variable of any of the varieties tested.

"It is pointed out in this paper that the variation constants measure a very important character of a variety. A variety which will yield very highly under favorable conditions but very poorly under unfavorable ones is not so desirable in the long run as a variety which will yield moderately well under any of the conditions that are likely to be met in any season. Further, the variation constants and the probable errors calculated with their aid give a very desirable measure of a series of tests. . . .

"The Regenerated Swedish Select and the Victor gave the highest average weight, about 41 lbs. per bushel. The Kherson and the Imported Scotch gave

the lowest weight per bushel. These were still well above the legal weight of 32 lbs. It is of interest to note that the Kherson shows a progressive increase in its weight per bushel for the four years that it has been grown in this State. . . .

"Of the varieties which have been tested for four years the Irish Victor, Imported Scotch, Lincoln, and Prosperity have made the best showing. With the exception of the Imported Scotch there appears to be but little choice between these varieties. The Imported Scotch has shown much less variability in respect to all its characters (with the exception of straw weight) than any of the other varieties. This is true both of inter- and intraseasonal variation. Under the conditions of seeding and growth at Highmoor this variety can be expected to produce a little over 60 bu. per acre every year. The chief objections to this variety are its relatively small weight per bushel and the yellow color of its grain. This latter objection is not very serious although yellow oats do not meet with so much favor on the market as the white varieties."

In discussing the results of the experiments the means, standard deviations, and coefficient of variation are used in estimating the values of the different varieties as affected by inter- and intraseasonal environmental conditions.

Peanuts (Arachis hypogea), C. D. GIROLA (*Rev. Facult. Agron. y Vet. La Plata, 2. ser., 10 (1914), No. 3, pp. 9–23, fig. 1*).—This article gives the history, geographical distribution, cultural methods, cost of production, and chemical analyses of the nuts and of the oil cake.

Some ecological evidence of the original habitat of the Irish potato (Solanum tuberosum), C. L. FITCH (*Proc. Soc. Hort. Sci., 10 (1913), pp. 99, 100*).—As evidence that the potato plant is a native of sandy open soils and a maritime atmosphere, or misty well-drained mountain slopes free from prolonged and heavy rains, the author notes his observations of the open structure of the stoma of the potato leaf, permitting rapid evaporation, and the loose incoherent structure of the root cap which is adapted only to penetration in open soils.

Observations on a bastard type of the Pearl potato, C. L. FITCH (*Proc. Soc. Hort. Sci., 10 (1913), pp. 100–104*).—In this article the typical Pearl potatoes, the "running out" type, and the bastard type are described and the results of cultural tests noted.

"The general summary of these results is that the normal Pearl tuber produces plants that are fairly productive and healthy, both in the district where it is most grown and in Minnesota, Wisconsin, and New York; that Pearl plants grown from tubers of the common run out type are most subject to disease, produce a poorer crop, and are more apt to bloom; while tubers of the bastard type produce plants that are very weak and lacking in resistance, that bear a much smaller crop, and that bloom profusely and produce abundant virile pollen and large fruits with many seeds.

"These facts are evidence that degeneracy of the potato tuber in the case of the Pearl in Colorado is accompanied in like degree by weakness and lack of resistance to disease."

Results of change of seed potatoes on moorlands (*Ztschr. Moorkultur u. Torfverwert., 12 (1914), No. 3, pp. 107, 108*).—The data show increased yields of potatoes from seed obtained from similar soil elsewhere over home grown seed of the same variety. Seed from sandy soil proved inferior to home grown seed.

The effect of sodium nitrate and ammonium sulphate on potatoes and sugar beets, A. MAUSBERG (*Landw. Jahrb., 46 (1914), No. 2, pp. 339–342*).—The results here recorded show a slightly heavier yield in a 5-year average of

potatoes when nitrate of soda was used in place of sulphate of ammonia, but the reverse was true with sugar beets.

Influence of transplanting in the cultivation of rice (*Gior. Risicolt., 4 (1914), No. 9, pp. 129–136*).—This article gives methods of cultivation, including transplanting. The itemized cost of production proved the method to be highly profitable.

The culture and preparation of rice in Italy (*Inst. Colon. Marseille Notice 12 (1914), pp. 95, figs. 36*).—This publication gives the proceedings of the congress and exposition of rice culture at Vercelli, and the following papers: The Culture and Preparation of Rice in Vercelli, by H. Jumelle (pp. 15–21); The Problem of Importations, Acclimatizations, and Seed Selections of Rice, by N. Novelli (pp. 22–28); The Best System of Combating Weeds in Rice Fields, by E. Ferrari (pp. 29–38); Fertilizers in the Culture of Rice, by A. Menozzi (pp. 39–41); The Application of Modern Machinery in Rice Culture, by G. Allorio (pp. 42–66); The Application of Modern Machinery in the Rice Industry, by A. Tarchetti (pp. 67–80); The By-products of Rice Culture, by L. Tognato (pp. 81–87); and Rice Culture in Sicily, by A. Lo-Jacono (pp. 88–95).

Rice, L. Granato (*O Arroz. Sao Paulo, Brazil, 1914, pp. 525, pl. 1, figs. 348*).—A treatise on the production of rice and its manufactured products, including some statistics from 26 rice-producing countries and a description of the culture in Brazil in particular.

Disintegration of rice grains by means of alkali, F. J. Warth and D. B. Darabsett (*Agr. Research Inst. Pusa Bul. 38 (1914), pp. 9, pls. 7*).—This paper notes and describes a method of using caustic potash as a means of detecting varieties of rice. The action of the potash in disintegrating the starch granules of polished rice in 24 hours shows characteristic differences for the different varieties.

Sorghums, sure money crops, T. A. Borman (*Topeka, Kans., 1914, pp. 316, pl. 1, figs. 71*).—The eight chapters of this book treat of the following subjects: The land of grain sorghums, development of the sorghum belt, grain sorghums in general, grain sorghum yields and values, sorghum areas defined, grain sorghum farming, better grain sorghum crops, and feeding grain sorghums.

The relation of leaves to the production of sugar in beets, H. Plahn-Appiani (*Bl. Zuckerrübenbau, 21 (1914), No. 11, pp. 165–168*).—From a study of this subject the author determined that not only the shape and setting of the leaves, but also the structure of the root, was important in the formation of sugar.

The vascular bundle system of the sugar cane, C. E. B. Bremekamp (*Meded. Proefstat. Java-Suikerindus., 4 (1914), No. 22–23, pp. 469–478, figs. 3; Arch. Suikerindus. Nederland. Indië, 22 (1914), No. 14, pp. 499–508, figs. 3*).—This article describes the anatomy of this system as determined in various parts of the sugar cane.

The anatomical structure of the rind of the sugar cane, C. E. B. Bremekamp (*Meded. Proefstat. Java-Suikerindus., 4 (1914), No. 22–23, pp. 478–484, figs. 4; Arch. Suikerindus. Nederland. Indië, 22 (1914), No. 14, pp. 508–514, figs. 4*).—This article describes the different cell layers of the rind of the sugar cane as revealed by the microscope.

Sunflower cultivation, H. G. Mundy (*Rhodesia Agr. Jour., 11 (1914), No. 5, pp. 730–734, pl. 1*).—The history and methods of cultivation and analyses of locally grown sunflower seed are given. The yields are reported to have reached from 1,500 to 2,000 lbs. of seed per acre in Mazoe and 3,000 lbs in the Cape Province.

On the inheritance of rapidity of germination, germinative ability, and sensitiveness to light of seeds of Poa pratensis, H. Pieper (*Fühling's Landw.*

Ztg., 63 (1914), No. 10, pp. 362–368).—Although there was some similarity obtained between the results of the original seeds and those of the next generation, the uniformity was not close enough for the author to determine a factor of inheritance.

The tillering of wheat, L. J. WILD (*Jour. Agr. [New Zeal.], 9 (1914), No. 1, pp. 31, 32*).—This article gives results of an experiment that show a slight increase in the tillering of wheat by a treatment of the seed with a 3 per cent solution of sulphate or nitrate of ammonia.

Impurities of agricultural seed, with a description of commonly occurring weed seeds and a guide to their identification, S. T. PARKINSON and G. SMITH (*Ashford, England, and Bishopsgate, Canada, 1914, pp. 105, pls. 38*).—This book discusses the topics of the harm done by weeds, introduction of new kinds of weeds to the country, seeds from foreign countries, weeds common in samples, and methods of testing, with a key for the identification of the seed described in this book, and descriptions and photographs of 150 common weed seeds.

Seed testing, A. ATKINSON and B. W. WHITLOCK (*Montana Sta. Circ. 38 (1914), pp. 11, figs. 4*).—This circular describes methods of testing seeds and gives descriptions of seeds of six common weeds.

Seed control stations on the Continent (*Jour. Bd. Agr. [London], 1914, Aug., Sup. 13, pp. 88, figs. 4, pls. 11*).—This describes the methods and work of the seed control stations at Copenhagen, Hamburg, Wageningen, Zürich, Budapest, Vienna, Munich, Breslau, and Berlin, and gives in an appendix results of some of the tests made at these stations.

Control of Cuscuta by devitalization of the seed, M. BRESAOLA (*Staz. Sper. Agr. Ital., 46 (1913), No. 2, pp. 89–136, pls. 3*).—Data are given showing the effect of subjecting several species of seeds used as host to high temperatures for varying periods of time and to a sulphuric acid bath.

Experiments in spraying to destroy dandelions, J. E. HOWITT (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 39 (1913), pp. 43, 44*).—This notes the successful spraying of dandelions on lawns with a 20 per cent solution of iron sulphate. Six applications seemed necessary. Ninety per cent of the dandelions are said to have been killed the first season with a general improvement in the thriftiness of the grass.

HORTICULTURE.

[Horticultural investigations at the Truckee-Carson Experiment Farm], F. B. HEADLEY (*U. S. Dept. Agr., Bur. Plant Indus., Work Truckee-Carson Expt. Farm, 1913, pp. 8–10, fig. 1*).—Tabular data are given on variety tests of tomatoes and onions conducted at the farm in 1913, together with a list of the trees and shrubs which have thus far been found to be well-adapted to the Truckee-Carson reclamation project.

[Horticultural investigations at the Wisconsin Station] (*Wisconsin Sta. Bul. 240 (1914), pp. 53, 54*).—A brief statement of progress in the station's cranberry investigations, together with a note on the experimental forcing of rhubarb.

Severe winter weather and severe June frosts did considerable damage to the cranberry bog. The observations made at the station indicate that sanding the bog will have little value as a means of frost protection when the temperature falls below 26 or 28° F. The application of rock phosphate on bare peat bog produced marked improvement in vine growth and crop yield, but also greatly stimulated the growth of grass. Nitrates and potash caused a material increase in the size of the fruit, together with improved color. In accordance with previous

results (E. S. R., 28, p. 838) the yield on plats sanded to a depth of 1 in. was much larger than that on those with no sand or on those sanded to only a depth of 0.5 in.

Cooperative tests with growers on the use of weed killers confirm the previous results of the station. A 10 per cent iron sulphate solution thoroughly applied with a good spray pump was very effective in killing wood moss.

Report on the statistics of vineyards, orchards and gardens, and root crops for the season 1913–14, L. H. SHOLL (*So. Aust. Statis. Dept. Bul. 3 (1914), pp. 6*).—Statistics on the area, production, and value are given for the year 1913–14, together with comparative data for the four previous seasons.

Heredity of xenia among certain races of kidney beans, J. DANIEL (*Rev. Hort. [Paris], 86 (1914), No. 11, pp. 253–257, pl. 1, figs. 7*).—In the study here reported crosses were made between the Spanish kidney bean and the black Belgian kidney bean during a period of three years.

The author's results show the existence of xenia in the seed resulting from these crosses. In some cases the seed coat was black like the paternal parent and in others there was a combination in various degrees of the colors of both parents. The studies thus far made with the descendants from these crosses indicate that xenia is transmitted to the progeny and that for the beans used in the experiment at least Mendel's law of inheritance does not apply.

The onion in Colorado, E. R. BENNETT (*Colorado Sta. Bul. 198 (1914), pp. 3–8*).—A brief popular treatise on onion culture with special reference to conditions in Colorado.

Onion culture, J. W. LLOYD (*Illinois Sta. Circ. 173 (1914), pp. 3–16*).—A short practical treatise discussing growing ripe onions from seed and sets, types of onions, the transplanting method, growing onion sets, and green bunch onions.

The California fruits and how to grow them, E. J. WICKSON (*San Francisco, 1914, 7. ed., rev., pp. 513, pls. 24, figs. 77*).—In the present edition of this work (E. S. R., 27, p. 439) the subject matter has been brought up to date.

Present state of fruit growing in Spain.—**The principal fruit trees of the Rosaceæ**, J. M. PRIEGO (*Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 7, pp. 836–842*).—A brief statistical review of deciduous fruit culture in Spain.

A study of variation in the apple, W. J. YOUNG (*Amer. Nat., 48 (1914), No. 574, pp. 595–634*).—The author made a study of some 24 varieties of apples obtained mostly from 14 localities in the State of Washington, although certain varieties were obtained from one locality in New Hampshire, Indiana, Missouri, New York, and West Virginia. In the present paper some brief comparative notes regarding the more conspicuous variations in each variety are given and the effect of environment upon various apple characters is discussed.

In connection with the investigation the author advances a fundamental principle upon which variation resulting from external factors depends. This principle, the Law of the Optimum, states that for any given variety there is for each character a certain intensity of each essential factor of the environment at which, other conditions remaining the same, that character reaches its highest development. In the application of this law to varietal adaptations the essential point is that all environmental factors should be of such intensity as to permit a good all-round development of the fruit.

On the chemical composition of the buds of some fruit trees, A. MANARESI and M. TONEGUTTI (*Staz. Sper. Agr. Ital., 44 (1911), No. 11–12, pp. 960–964; 47 (1914), No. 2, pp. 158–160*).—In continuation of the work previously noted (E. S. R., 26, p. 407), analyses are reported in the first paper of fruit and leaf buds of the apple and pear, the buds being taken from the tree near the close of

the dormant season, and in the second of the leaf and flower buds of some peaches and apricots.

Summer pruning the peach, C. A. KEFFER (*Tennessee Sta. Bul. 108 (1914), pp. 205–212, figs. 9*).—This comprises a discussion of summer pruning the peach as a means of developing fruiting wood on the lower part of the main or skeleton branches which are usually bare. The subject matter is based upon the results of pruning tests conducted at the station and herein noted.

Some fertilizer tests in vineyards, F. H. HALL (*New York State Sta. Bul. 381 (1914), popular ed., pp. 3–8*).—A popular edition of the bulletin previously noted (E. S. R., 31, p. 339).

Layering as a means for increasing the yield from old vines, A. VERNEUIL (*Rev. Vit., 42 (1914), No. 1074, pp. 57–60, figs. 3*).—The author reports the successful renovation of old grapevines by means of layering.

Strawberry culture, A. K. GARDNER and H. P. SWEETSER (*Bul. [Maine] Dept. Agr., 13 (1914), No. 3, pp. 28, pl. 1, figs. 13*).—A popular treatise.

Summary of preliminary Feijoa pollinating experiments, K. A. RYERSON (*Univ. Cal. Jour. Agr., 2 (1914), No. 2, pp. 51–53*).—Preliminary experiments conducted by the author in 1913 and 1914 relative to the nonsetting of fruit with the feijoas (*Feijoa sellowiana*) indicate that the blossoms are largely sterile to their own pollen and that the trouble may be overcome by mixed plantings of different varieties.

The Siamese pomelo, H. H. BOYLE (*Jour. Heredity, 5 (1914), No. 10, pp. 440–444, fig. 1*).—The author describes four types of seedless pomelos obtained from Siam for the Philippine Bureau of Agriculture. Two of these types are considered to be both excellent in quality and desirable for market purposes.

Tea: Green manuring at the experiment station, Peradeniya, M. K. BAMBER (*Dept. Agr. Ceylon Bul. 9 (1914), pp. 119–134, pls. 3*).—A progress report on the pruning, cultivation, and manuring experiments with tea at the Peradeniya station (E. S. R., 25, p. 139). Summarized data are given showing the yields of tea on the various plats for 1906 to 1913, inclusive.

With the flowers and trees in California, C. F. SAUNDERS (*New York, 1914, pp. XIV+286, pls. 28*).—In this work the author describes in a popular way certain characteristic features of the indigenous and exotic trees and flowers in California.

Classification of daffodils for use at all exhibitions of The Royal Horticultural Society (*London: Roy. Hort. Soc., 1914, pp. 73*).—In the present classification, which is designed for exhibition purposes, the daffodils are divided into eleven divisions. A general list is then given of all known varieties, and each variety is referred to its proper class or division in so far as the varieties are sufficently well-known to be clasified.

Preserving cut flowers, L. KNUDSON (*Amer. Florist, 43 (1914), No. 1376, pp. 649, 650*).—Some experiments were conducted by B. M. Duggar and the author in 1908 and by the author and Lua A. Minns in 1913 to determine whether or not the keeping quality of flowers can be prolonged by special methods of treatment. In the experiments here described a large number of chemical solutions of different concentrations were tested with reference to their value for prolonging the life of flowers of relatively short duration of life.

Over 10,000 cut flowers were used in the experiments, including the following kinds: Cosmos, petunia, aster, verbena, violet, coreopsis, dahlias, *Tagetes erecta* (African marigold), *T. patula*, geranium, zinnias, sweet peas, and pansies. The results did not at all substantiate the favorable work secured by Fourton and Ducomet (E. S. R., 18, p. 44) and in no case were any striking results secured. An increase of a day or so in the keeping qualities was frequently obtained but it is believed that this might have been due to other causes. With certain

flowers which tend to foul badly when placed in water some benefit was derived by the use of such chemicals as zinc sulphate, copper sulphate, manganese sulphate, and admixtures of strontium and barium chlorid with calcium chlorid in killing micro-organisms. The author points out that the possibilities of prolonging the keeping qualities of flowers are much greater with flowers which have a long period of life. The desirability of experiments with flowers of this kind is suggested.

FORESTRY.

Studies in tolerance of New England forest trees.—II, Relation of shade to evaporation and transpiration in nursery beds, G. P. BURNS and FRANCES P. HOOPER (*Vermont Sta. Bul. 181 (1914), pp. 235–262, pls. 8, figs. 2*).—In continuation of previous work with forest seedlings (E. S. R., 31, p. 640) the authors are conducting a study of the effect of shade upon the physical conditions for the germination and development of seedlings. The experiments here reported were carried on with white pine seedlings during the summer of 1913. The work deals particularly with the effect of lath screens on evaporation from the seed bed and on transpiration from the seedlings. An attempt was also made to determine the relation between the water loss from the seedlings and evaporation as measured by both black and white porous atmometer cups. Three seed beds were used in the experiment, the conditions being the same for all, except that the first was given no shade on the top; the second was covered with a lath screen in which the laths were spaced one lath's width apart; and the third was covered with a solid lath screen. All determinations of water losses were made by weight. The plants used for weighing were grown in pots plunged in the seed beds, the tops of the pots being covered with rubber dams to prevent evaporation. The series of observations reported extended over the first two weeks of August. The data are presented in a series of curves and tables and discussed.

The responses of the atmometers and plants were not identical, the quantitative responses differing more than the qualitative responses. In the half shade bed the differences observed in responses of instruments and plants were less than those observed in the no shade bed, the effect of half shade upon the plants being more marked than on the instruments. Both plants and atmometers lost but little water in the full shade bed. The evaporation-transpiration coefficients based on the unit of dry weight of the plants for no shade, half shade, and full shade beds show that the response of the plant agrees more closely with the black atmometer than with the white atmometer. A comparison of the losses from seedlings from the no shade bed with the losses from 2- and 3-year-old potted plants in the open shows that the seedlings give off water much more rapidly than the older plants, thus indicating the need of some protection for young plants. The daily averages of the losses from instruments and plants were found to smooth out extremes and conceal quantitative differences, thus minimizing the value of conclusions based on general averages.

The authors conclude that in order to determine a definite relation between atmometer and plant measurements "we need to know the effect of variation in each of the following factors: Light, wind velocity, humidity, and temperature on instruments and plants."

A brief bibliography of consulted literature is appended.

Tree growth and seed, J. B. BERRY (*Jour. Heredity, 5 (1914), No. 10, pp. 431–434, figs. 2*).—A brief review of Engler's investigations relative to the influence of environment on tree growth (E. S. R., 30, p. 239).

Osier culture, F. KNOTEK (*Arb. Deut. Sek. Landeskult. Rat. Königr. Böhmen, No. 18 (1914), pp. 21, figs. 10*).—Practical instructions are given for the culture of basket willows.

The coniferous forests of eastern North America, R. M. HARPER (*Pop. Sci. Mo., 85 (1914), No. 4, pp. 338–361, figs. 16*).—This comprises a descriptive account of the important coniferous forest types of eastern North America. Each type is considered with reference to its geographical distribution, correlations with soil, water, climate, fire, etc. Notes are also given on the economic aspects of the trees and the regions in which they grow.

The rôle of aspen in the reforestation of mountain burns in Arizona and New Mexico, G. A. PEARSON (*Plant World, 17 (1914), No. 9, pp. 249–260, figs. 2*).—Experiments conducted for several years under the direction of the Fort Valley Station, Flagstaff, Ariz., in planting Douglas fir in aspen thickets and adjoining openings have demonstrated that aspens are of considerable value in reforestation. The superiority of the aspen-covered areas over the openings is attributed mainly to a reduction in transpiration. The value of aspens in regulating transpiration from fir seedlings appears to more than compensate for the loss in soil moisture taken up by the aspen trees.

Tree distribution in central California, W. A. CANNON (*Pop. Sci. Mo., 85 (1914), No. 5, pp. 417–424, figs. 4*).—The author here briefly outlines the root characters of the three most prominent species of oak of central California with special reference to their ability to reach ground water at different depths, and points out the intimate relationship between root character and the characteristic local distribution of the species.

Timber conditions in Little Smoky River Valley, Alberta, and adjacent territory, J. A. DOUCET (*Dept. Int. Canada, Forestry Branch Bul. 41 (1914), pp. 52, figs. 16*).—In continuation of a previous report (E. S. R., 27, p. 646) a report is given on the work done during the summer of 1912, completing the reconnaissance and delimitation survey of the proposed Lesser Slave Lake Forest Reserve. In addition to a description of timber conditions suggestions are given relative to the protection of these forests from fire. A map accompanies the report.

Timber and soil conditions of southeastern Manitoba, L. C. TILT (*Dept. Int. Canada, Forestry Branch Bul. 45 (1914), pp. 36, pl. 1, figs. 13*).—This embraces the results of a survey conducted under the direction of the Forestry Branch of the Canadian Government in 1912. A considerable proportion of the country was found suitable for a forest reserve and a map is included in the bulletin showing this tract.

The forests of Madagascar: Their characters, resources, and conservation, R. BADIN (*Bul. Écon. Gouvt. Gén. Madagascar, 14 (1914), I, No. 1, pp. 33–58*).—A descriptive account of the forests of Madagascar, including information relative to their exploitation and steps which have thus far been taken for their conservation.

The tannin-yielding acacias of Senegal, Y. HENRY and P. AMMANN (*Acacias à Tanin du Sénégal. Paris, 1913, pp. 53, figs. 8*).—Descriptions are given of a number of tannin-yielding acacias, including some other tannin-yielding species, together with analyses of various parts of the tree with special reference to their tannin content.

The tapping of pines and resin exploitation in Tonkin, CARRIÈRE (*Bul. Écon. Indochine, n. ser., 17 (1914), No. 108, pp. 329–335, figs. 3*).—A short descriptive account of turpentine and resin exploitation in Tonkin.

Measurement of woods for statistical purposes, D. W. YOUNG (*Quart. Jour. Forestry, 8 (1914), No. 4, pp. 253–275*).—In this paper the author discusses the

nature of the information required in making tree measurements and describes the methods adopted by the British Board of Agriculture in making tree measurements.

Lumber and its uses, R. S. KELLOGG (*Chicago, 1914, pp. 352, pls. 39, figs. 12; rev. in Engin. Rec., 70 (1914), No. 1, p. 26*).—This is a compilation of general information on the subject. Beginning with the structure and physical properties of the wood, the author proceeds to lumber grades, standard sizes of lumber, and shipping weights. A discussion of structural timbers includes standard definitions and Forest Service rules. Chapters follow on seasoning of timber, wood preservation, paints and stains, wood paving blocks, hardwood flooring and fire resistance, and lumber prices. Under the two headings "the uses of lumber" and "commercial woods" is given a somewhat long and detailed discussion of the uses to which each kind of lumber is put and the kinds of wood which supply the material for a large number of wooden commodities. Statistics as to forest products and the timber supply, and a section giving sources of information about lumber, are also included.

Vocabulary of forest terms, compiled by W. A. A. REINHARDT (*Harrisburg, Pa., 1909, pp. 24*).—This comprises a vocabulary of terms in silviculture, forest protection, and forest utilization found in Schwappach's Forestry (Forstwissenschaft) (E. S. R., 16, p. 1083).

DISEASES OF PLANTS.

[Investigations in plant diseases] (*Wisconsin Sta. Bul. 240 (1914), pp. 47–53, 54, 55, figs. 8*).—A summary is given of recent investigations on plant diseases carried on under the direction of L. R. Jones, R. E. Vaughan, and others, the principal investigations being on onion smut, pea blight, disease-resisting cabbage, barley seed disinfecton, root rot of tobacco, black rot of tobacco, and false blossom of cranberries.

The experiments for the control of onion smut demonstrated that formalin solution applied to the seed disinfected both seed and surrounding soil, and not only greatly reduced the amount of smut, but nearly doubled the yield.

In the pea blight investigations, which have been carried on for several years, the methods of control previously reported (E. S. R., 28, p. 844) have been tried under field conditions. Definite benefits were obtained by plowing and harrowing immediately after the removal of the crop, repeating these operations three times before freezing. The use of clean seed and a strict rotation of crops, together with plowing immediately after crop removal will greatly reduce loss from this disease. It has been previously shown that the spores of the fungus are carried over by the straw or stubble, and in connection with some of the new canning plants in the State, silos have been constructed by which the pea vines are utilized, the process of fermentation destroying the fungus.

Continued success is being met with in the experiments for the breeding of cabbage resistant to yellows, and sufficient seed of the second generation was obtained in 1913 for distribution and demonstration trials during 1914.

In experiments with the modified hot-water treatment of grain, A. G. Johnson found that soaking the grain for six hours in cold water, then for fifteen minutes in water heated to 126° F., completely eliminated the smut and reduced the barley stripe disease from 20 per cent to less than 1 per cent in treated plats.

In reporting upon the root rot and the black rot of tobacco, J. Johnson points out that serious loss in Wisconsin and Ontario, as well as elsewhere, is due to the presence of the root rot fungus (*Thielavia basicola*). This may be largely controlled by proper sterilization of the seed bed, as much of the disease origi-

nates in that way. The black rot is said to be due to *Sterigmatocystis nigra*, which affects the tobacco after it is harvested. A high moisture content and high temperature in the curing house favor the development of this disease. Practical methods for its control have been worked out which are based on the regulation of the percentage of moisture in the leaf and control of temperature during fermentation.

In cooperation with C. L. Shear, of this Department, L. R. Jones has carried on some investigations on the false blossom of cranberries, which is found to be a physiological trouble due to unfavorable cultural conditions. The most important factor for the elimination of this trouble is said to be proper drainage. Surveys made of cranberry diseases indicate that while other diseases are present, none are serious that can not be controlled by spraying or other well-recognized methods.

Fungus diseases of plants, S. L. Ajrekar (*Poona Agr. Col. Mag., 5 (1914), No. 3, pp. 184–192*).—As a preliminary account of plant diseases, brief descriptions are given of millet smut, grapevine mildew, red rot in sugar cane, and Koleroga disease of palms, together with suggestions for their control.

Phytopathological report for 1913, E. Foex (*Rev. Phytopath. Appl., 1 (1914), Nos. 18–19, pp. 13–15; 20–21, pp. 17–23; 22–23, pp. 25–29*).—Condensed accounts are given of observations on diseases of cereals, tubers, forage plants, vines, fruits, berries, pines, and oaks, with some remedies tested or proposed.

Diseases of plants.—I, Herbaceous plants, B. Tomei (*Malattie delle Piante. Piante Erbacee. Urbino, Italy, 1913, pt. 1, pp. 111*).—This contains very brief discussions of several diseases, with proposed remedies, of wheat, corn, vetch, potato, tobacco, alfalfa, clover, sulla, and sainfoin.

The introduction of model treatments of plant diseases in Posen and West Prussia, R. Schander (*Mitt. Deut. Landw. Gesell., 29 (1914), No. 21, 294–298*).—This is a brief outline of the proposed general plan and scope of operations for the protection of economic plants from various diseases in this section.

Some practical means of combating plant diseases as employed in Russia, A. de Jaczewski (*1. Cong. Internat. Pathol. Comparée [Paris], 1912, vol. 2, Comp. Rend., pp. 948–955*).—Among the results reported, it is claimed to have been shown that the general requirements for a practical fungicide are best fulfilled by a mixture of copper sulphate and alkaline polysulphids, this proving safe, cheap, and efficacious, as instanced by tests on *Phyllosticta briardi* on apple trees, the proportion formerly used (0.5 per cent of each component) being found to be reducible to 0.2 per cent of the former and 0.3 per cent of the latter.

The immense damage formerly done by *Sphærotheca mors-uvæ* to gooseberry has been greatly reduced by use of alkaline polysulphids. The hot water treatment for *Ustilago hordei* and *U. tritici* is thought to be limited in its beneficial effect only by the present difficulty in securing the best conditions for its employment.

Heredity of disease in plants and Mendelism, L. Blaringhem (*1. Cong. Internat. Pathol. Comparée [Paris], 1912, vol. 1, Raps., pp. 250–312, figs. 12*).—This is a somewhat comprehensive discussion, dealing with different phases and probable origins or causes of anomaly or disease in plants, including the influence of heredity and environment, as well as of parasitism. A bibliography is appended.

Tumors of roots and rootlets, O. Larcher (*1. Cong. Internat. Pathol. Comparée [Paris], 1912, vol. 1, Raps., pp. 312–328*).—This is a brief general treatment as to tumors of underground portions of plants, as regards their external characters, pathological anatomy, effects, etc., with a somewhat extensive bibliography of the subject.

The root parasites of the Bombay Deccan, H. VAN BUUREN (*Poona Agr. Col. Mag., 5 (1914), No. 3, pp. 193–196, pl. 1*).—The author describes the attack of *Striga lutea* on durra, pearl millet, maize, and other grasses in India.

Propagation of rust of cereals, J. BEAUVERIE (*1. Cong. Internat. Pathol. Comparée [Paris], 1912, vol. 2, Comp. Rend., pp. 960–965*).—In this brief preliminary note the author claims to have demonstrated the frequent presence of uredospores, teleutospores, and mycelium of grain rusts in the pericarp of wild and cultivated grains. It is thought that the young plants are often thus contaminated as soon as they begin to develop in spring.

Powdery scab, a new potato disease, E. S. BRIGHAM (*Bul. Vt. Dept. Agr., No. 18 (1914), pp. 1–7, fig. 1*).—A popular report is given of the powdery scab, due to *Spongospora subterranea*, in order that potato growers may be informed regarding the avoidance of its possible introduction.

Wart disease of potatoes, J. ERIKSSON (*Jour. Bd. Agr. [London], 21 (1914), No. 2, pp. 135, 136*).—The author reports the results of an experiment bearing upon the possibility of eradicating the wart disease of the potato.

Diseased tubers were planted in plats surrounded to a depth of 1 meter by a zinc casing, the ground being treated some weeks later with a 1 per cent solution of commercial formalin at the rate of 10 liters per square meter (about 1 qt. per square foot). All the plats so treated were entirely free from the disease, while the control plats showed about 66 per cent of the plants infected to some extent. It is thought possible to eradicate potato wart disease from any field by employing stronger solutions where necessary.

Bacterial diseases of the roots of sugar beets, G. TRZHEBINSKĬĬ (*Vĭestnik Sakhar. Promysh., No. 36–39 (1911); abs. in Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 13 (1912), No. 4, pp. 621–625*).—The author gives an account of studies of a dry and a slimy rot of beet roots noted on plantations in the Government of Kiev.

In connection with the former disease, which is described in three forms according to the portion of the plant attacked, he found two bacteria. This form of rot, which is widely distributed in southwestern Russia, differs from the dry rot as known in Germany accompanied by heart rot, in that the latter appears in the first year of the growth and not during the wintering of the roots or in transplanting. The slimy rot shows the presence of both these bacterial forms and also of a third, which is described, as are also the symptoms characteristic of this form of rot. Both transfer and contact inoculations from roots affected with slimy rot produce dry rot in healthy beets. The author is inclined to consider dry rot of the roots as dry bacteriosis.

Puccinia subnitens on the sugar beet, VENUS W. POOL and M. B. MCKAY (*Phytopathology, 4 (1914), No. 3, pp. 204–206, pl. 1*).—Attention is called to the occurrence of the æcial form of *P. subnitens* on sugar beets, the telial host of which is said to be *Distichlis stricta*.

For the control of this disease, which is said to be of increasing economic importance, the destruction of salt grass, which is quite common along the roadsides and ditches, is recommended.

[Lime treatments of soil for Plasmodiophora brassicæ], D. A. GILCHRIST (*County Northumb. Ed. Com. Bul. 21 (1914), pp. 84–88*).—Giving in connection with figures previously reported (E. S. R., 29, p. 752) the results obtained from the use of various treatments in 1913 for finger-and-toe disease of swedes, the author states that a decrease was noted in the beneficial influence of lime mud after its employment for nine successive years on the same ground.

Diseases and deformities of mushrooms, F. GUÉGUEN (*1. Cong. Internat. Pathol. Comparée [Paris], 1912, vol. 2, Comp. Rend., pp. 956–960*).—Giving results of some observations made on cultivated mushrooms showing abnor-

malities, the author states that along with the well known "mole" characteristic of their invasion by *Hypomyces perniciosus* there exist also in both these and wild mushrooms other characteristic deformities or ruptures. Some of these are due to parasitism, as evidenced by a characteristic odor and other indications of the organic nature of the trouble, which has been noted in connection with the presence of certain plant mites.

Plus and minus strains in the genus Glomerella, C. W. EDGERTON (*Amer. Jour. Bot., 1 (1914), No. 5, pp. 244–254, pls. 2, fig. 1*).—The substance of this contribution has already been noted from another source (E. S. R., 30, p. 745).

A study of the physiological relations of Sclerotinia cinerea, J. S. COOLEY (*Ann. Missouri Bot. Gard., 1 (1914), No. 3, pp. 291–326*).—A report is given of an experimental study on the physiological activities of the brown rot fungus of stone fruits, in which the conditions influencing the penetration and infection of green and ripe fruits by the fungus were studied as well as the action of the parasite on the host cells and the secretion of enzyms which act upon the cellulose and pectic substances of the host.

It was found that the brown rot organism infects immature fruit provided the skin is punctured, while on the other hand ripe or nearly ripe fruits may be readily inoculated through the unpunctured surface. The fungus was found to penetrate with equal ease any part of the host tissue, showing no preference for the middle lamella. No evidence was found that the fungus secreted a toxic substance in advance of penetration. An aqueous solution of pectin isolated from plums was coagulated by the fungus, indicating the secretion of pectinase. The changing acidity of the host as the fruit reaches maturity was not considered sufficient to explain the fact that ripe fruit is more susceptible to the disease than green fruit.

A bibliography is appended.

Protection against Sphærotheca mors-uvæ, D. HEGYI (*Rev. Phytopath. Appl., 1 (1914), No. 22–23, pp. 30, 31*).—The author reports that in experiments since 1909 looking toward control of gooseberry mildew it was found that treatment with liver of sulphur caused fall of both fruit and leaves, also that iron sulphate had little effect on the disease. Bordeaux mixture, however, applied once or twice during the winter at 5 per cent and in early spring at 1 per cent strength, or lime sulphur employed according to plans outlined, is an efficient means of defense against this fungus.

The status of investigational work on pear and apple blight, D. B. SWINGLE (*Montana Sta. Circ. 39 (1914), pp. 13–16*).—The author gives a summary of work that has been carried on by this Department and various experiment stations on the cause and methods of control of pear and apple blight due to *Bacillus amylovorus*.

Black spot of the mandarin (*Agr. Gaz. N. S. Wales, 25 (1914), No. 8, p. 684*).—The prevalence of black spot in mandarin orchards in New South Wales is reported. Pending experiments for combating the disease, it is recommended that infected trees be severely pruned, and after pruning the trees and ground beneath should be sprayed with Bordeaux mixture or lime sulphur, three applications during the season being considered sufficient.

Spraying experiments with the peach and grape in 1912, E. PANTANELLI (*Staz. Sper. Agr. Ital., 46 (1913), No. 5, pp. 329–346*).—Reporting on later experiments (E. S. R., 27, p. 855), the author states that polysulphids of calcium and barium, kept in sealed receptacles and diluted at the time of application, were found to be efficacious in controlling *Exoascus deformans* on the peach, but not *Plasmopara viticola* on the grape. Bordeaux mixture gave good results against *P. viticola*. Self-boiled lime sulphur proved helpful against *E. deformans* on peach, also against *Monilia cinerea*.

Dry leaf of the grape, M. TURCONI (*Riv. Patol. Veg., 6 (1913), No. 9, pp. 260, 261*).—A leaf disease of the grape near Pavia, characterized by premature drying, and noted in some American varieties, is ascribed to *Pestalozzia uvicola*.

Base rot of pineapples (*Agr. News [Barbados], 13 (1914), No. 316, p. 190*).—In a locality not known to have produced pineapples previously, cuttings carefully disinfected with Bordeaux mixture before planting developed a diseased condition, apparently due to *Thielaviopsis paradoxa*. It is thought that the presence of the fungus may be due to a previous cultivation of sugar cane in these places or perhaps to the use of organic manure. There is said to be some evidence that plants sometimes throw off the disease. Development of resistant strains is suggested.

Decay of pineapples (*Agr. News [Barbados], 13 (1914), No. 318, p. 222*).—In continuation of the above discussion another pineapple disease is discussed, ascribed to the same causal organism, which frequently enters through the cut end of the stem and passes with great rapidity up through the core, spreading through the softer tissues and producing a water-soaked appearance; also entering readily through wounds and bruises and even through the uninjured fruit surface.

Care in handling includes cutting off and searing or waxing the stems. The fruit should cool and dry for 24 hours before packing, and should be protected from bruising or rubbing without greatly interfering with the circulation of air. Fumigation with formaldehyde gas has been found helpful, and directions for this are given.

Cladosporium disease of Ampelopsis tricuspidatum, M. T. COOK and G. W. WILSON (*Phytopathology, 4 (1914), No. 3, pp. 189, 190, fig. 1*).—In continuation of a previous note (E. S. R., 31, p. 347), the authors report having had their attention called to the dying of Japanese ivy on buildings of Rutgers College and other buildings in the vicinity.

The disease first appeared as a wilting of the leaves, which might be confined to a small branch or might extend to a main trunk and all its branches. Within a few days all the diseased parts were dead and dry. A fungus was isolated from diseased material, and it was found to agree rather closely with the description of what is usually given as *C. herbarum*.

Spontaneous decapitation of chrysanthemums, R. FARNETI (*Riv. Patol. Veg., 6 (1913), No. 10, pp. 289–292*).—Fall of the floral heads of crysanthemums at flowering, due to rupture of the peduncles, led to a study of the phenomenon. It is thought that an irritative and toxic influence is exerted by a Cladosporium found in connection with the trouble, also that a part is played by turgescense at such times.

Black rot of roses, J. BEAUVERIE (*1. Cong. Internat. Pathol. Comparée [Paris], 1912, vol. 2, Comp. Rend., pp. 965–967, fig. 1*).—Reporting on an examination of diseased roses sent in for this purpose, the author states that the flowers showing the peduncle disease formerly attributed to *Botrytis cinerea* (E. S. R., 24, p. 351) now showed no mycelium in the diseased peduncles, and that these portions, when kept in a confined atmosphere, either dry or moist, produced no Botrytis, but that this fungus was noted in adjacent green portions. Further investigation, as regards the immediate nature or cause of the disease and its remedies, is considered necessary.

A study of a rose disease, J. BEAUVERIE (*1. Cong. Internat. Pathol. Comparée [Paris], 1912, vol. 2, Comp. Rend., pp. 968–971, figs. 2*).—A brief account is given of a disease of roses attributed to *Coryneum microstictum*.

A Glœosporium disease of the spice bush, J. J. TAUBENHAUS (*Amer. Jour. Bot., 1 (1914), No. 7, pp. 340–342*).—The author reports on a study of diseased spots

on the fruit, leaves, and tender twigs of the spice bush. This is claimed to be due to an active parasite identical with *G. officinale* from the sassafras, and also with *G. fructigenum*, which causes bitter rot of the apple.

A disease of Gerbera, L. MAFFEI (*Riv. Patol. Veg., 6 (1913), No. 9, pp. 257–259*).—A brief account with description is given of a fungus, *Ascochyta gerberæ* n. sp., attacking leaves of *G. jamesoni*, recently introduced into Italy from South Africa.

A disease of Washingtonia, G. POIRAULT and A. SARTORY (*1. Cong. Internat. Pathol. Comparée [Paris], 1912, vol. 2, Comp. Rend., pp. 971, 972*).—Two species of Washingtonia, *W. filifera* and *W. robusta*, are said to show progressive attack from a disease decolorizing the leaves and suspected to be due to a Penicillium.

Notes on some diseases of trees in our National Forests, IV, G. G. HEDGCOCK (*Phytopathology, 4 (1914), No. 3, pp. 181–188*).—In continuation of a previous report (E. S. R., 29, p. 851), the author gives an account of the infection of various forest trees by *Herpotrichia nigra*, *Xenopeckia coulteri*, *Fomes pinicola*, *F. fomentarius*, *F. applanatus*, *Polyporus schweinitzii*, and *F. roseus*. Most of these fungi are found parasitic on various species of coniferous trees.

Bark disease of the chestnut in British Columbia, J. H. FAULL and G. H. GRAHAM (*Forestry Quart., 12 (1914), No. 2, pp. 201–203*).—Specimens of bark taken from diseased chestnut trees at Agassiz, British Columbia, have been examined, and all tests so far made indicate that the fungus is identical with *Endothia parasitica*, the cause of the chestnut bark disease. The trees growing at Agassiz are of Oriental, European, and American origin. Inoculations constituting the final tests are to be reported on later.

Pathological histology of the Endothia canker of chestnut, W. E. KEEFER (*Phytopathology, 4 (1914), No. 3, pp. 191–200, figs. 3*).—The author describes the different anatomical conditions shown in the bark and sapwood of chestnut when attacked by *E. parasitica*.

In an experiment conducted to determine the depth to which the fungus penetrates into the wood, it was found that the average depth of penetration for about 20 logs was approximately $\frac{1}{8}$ in., the greatest penetration being about $\frac{1}{2}$ in. The deepest penetration was found in the smaller limbs.

Damage due to oak mildew in Hungary, F. KÖVESSI (*1. Cong. Internat. Pathol. Comparée [Paris], 1912, vol. 2, Comp. Rend., pp. 924–936*).—Giving a brief account of the spread in Europe of oak mildew after its appearance about 1907, with comments on its possible relations to altitude, weather, caterpillars, etc., the author states that among the more susceptible of European oaks are *Quercus tozza*, *Q. pedunculata*, *Q. sessiliflora*, *Q. pubescens*, *Q. contorta*, *Q. cerris*, *Q. ilex*, *Q. suber*, and *Q. coccifera*. The American oaks are said to be more resistant than natives. *Fagus sylvatica* and *Castanea vulgaris* appear to be rarely attacked.

Of the various remedies mentioned, flowers of sulphur is said to be the cheapest and most efficacious in this connection.

An extensive bibliography is given.

Notes on economic fungi, M. T. COOK (*Phytopathology, 4 (1914), No. 3, pp. 201–203, figs. 2*).—A brief account is given of the crown gall due to *Pseudomonas tumefaciens* on Bolleana poplars, and of the occurrence of a sclerotium which contained a mass of well developed asci containing spores in potatoes infected by Rhizoctonia.

North American species of Peridermium on pine, J. C. ARTHUR and F. D. KERN (*Mycologia, 6 (1914), No. 3, pp. 109–138*).—Sixteen species are described, of which *P. californicum* and *P. guatemalense* are considered to be new species. A host index is given of species of Peridermium on species of pines.

Purchase and use of liver of sulphur (*Jour. Bd. Agr.* [*London*], *21* (*1914*), *No. 3, pp. 236–241; noted in Agr. News* [*Barbados*], *13* (*1914*), *No. 320, pp. 254, 255*).—The results are given of tests made to determine the effects of exposure by loose corking, etc., on stored potassium sulphid.

The solution, when kept in vessels covered but not corked for 18 days, deposited sulphur, and ultimately lost much or all of its value as a fungicide. It is therefore held that solutions of liver of sulphur should be prepared just before they are to be used, or the solutions, if made beforehand, should be kept in full, tightly corked bottles. Liver of sulphur in solid form should be kept in bottles or lever-topped tins of small capacity, say from 0.5 to 1 lb. capacity, to be opened just before use.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Animal geography: The faunas of the natural regions of the globe, MARION I. NEWBIGIN (*Oxford, England, 1913, pp. 238, pls. 31, figs. 13*).—In this book the author attempts to put the main facts connected with the distribution of animals in a form acceptable to the geographical student. It deals with the subject under the following chapter headings: The tundra and its fauna; the taiga, or coniferous forest, and its fauna; steppe faunas and the Temperate steppes of Asia and North America; mountain faunas; the fauna of the tropical forest; tropical savannas and deserts; special features of island faunas; the distribution of animal life in the sea; the animals of lakes and rivers and cave faunas; and zoogeographical regions.

[Game in California] (*Cal. Fish and Game Comrs. Game Bul. 1* (*1913*), *pp. 67, figs. 14*).—The several papers here presented are as follows: Investigation of the Large Game Situation in California with Special Reference to Deer, by F. C. Clarke (pp. 6–20); The Present and Future Status of the California Valley Quail, by H. C. Bryant (pp. 21–34); Introduction of Foreign Game Birds into the Southern San Joaquin and Tributary Sections, by A. D. Ferguson (pp. 36–40); Educating the Young People as to the Need and Value of Wild Life Conservation, by Gretchen L. Libby (pp. 41–46); and Investigation of the Economic Status of Nongame Birds, by H. C. Bryant (pp. 47–67).

The food of the common mole, P. B. WHITE (*Jour. Bd. Agr.* [*London*], *21* (*1914*), *No. 5, pp. 401–407*).—The results of studies of the food of 100 individuals of the common mole (*Talpa europea*) collected in two localities are presented in tabular form. "It is clear that earthworms and, in the moles examined, leather jackets are to be looked upon as the staple articles of diet, these appearing in 92 per cent and 87 per cent of the stomachs, respectively. Centipedes came next in 50 per cent and wireworms in 41 per cent of the stomachs."

The control of rodents in field seeding, C. P. WILLIS (*Proc. Soc. Amer. Foresters, 9* (*1914*), *No. 3, pp. 365–379*).—"Rodents and white-footed mice in particular destroy a large percentage of our field-sown seeds. The rodent loss is so high that it guaranties failure of seeding. Either the rodent must be controlled or seeding must be given up.

"Rodents have such keen noses that it is impracticable to hide seed from them by burying it deeply or by disguising its odor. It is possible that a substance poisonous or distasteful to rodents may yet be found effective for coating seeds. Up to the present no satisfactory coating has been discovered. Sowing seed incased in screen wire has little to commend it. Wholesale poisoning of rodents is ineffective. Many, but too few, animals can be poisoned. Mulching the seedspot has a slightly beneficial effect. Covering the seedspot with tar roofing paper has given excellent protection to the seed. This method has disadvantages, however, which need further study. Complete protection is given by

covering the seedspots with a wire cone 8 in. high and 8 in. in diameter, sunk 2 in. deep in the ground, but this is too costly for general use.

"It is significant that attempts to render the seed repulsive or poisonous to the rodent have failed; that wholesale poisoning of an area has failed; but that efforts to guard the seedspot have been more successful. It is at this point that the study should be taken up, if it is hereafter continued."

Necessity for and constitutionality of the act of Congress protecting migratory birds, G. SHIRAS, 3RD (*New York, 1914 pp. 99*).—Part one of this pamphlet deals with the necessity for the migratory bird law and part two with the constitutionality of the federal law. The regulations for the protection of migratory birds (E. S. R., 29, p. 554), the text of the original Shiras bill and of the Weeks-McLean bill (E. S. R., 28, p. 302), the report of the advisory committee of fifteen on the preparation of regulations by the Department of Agriculture for the protection of migratory birds, etc., are appended.

The relation between lizards and Phlebotomus verrucarum as indicating the reservoir of verruga, C. H. T. TOWNSEND (*Science, n. ser., 40 (1914), No. 1023, pp. 212–214*).—It is stated that numerous blood smears made during the previous two or three months from small rock lizards of several species collected in four localities in Peru, three of which are within the verruga zone and the fourth just outside of that zone, all show small rod and granule bodies which exhibit the identical morphology of the bodies which have been named *Bartonia bacilliformis*.

"In Verrugas Canyon there are, close to the house, many large walls built of loose rock wherein the Phlebotomus hide in swarms during the day, issuing in the evening to enter the house and bite the inmates. These rock walls are also inhabited by the small lizards in question."

Subcutaneous injection of a young guinea pig with a large quantity of citrated lizard blood proved fatal within ten hours, liver smears showing the rods and granules, but blood, marrow, and spleen smears proving practically negative.

The author points out that on a priori grounds the inference is logical that the lizards constitute a verruga reservoir.

The relation of temperature to insect life.—I, The variation in velocity of development at different constant temperatures, E. D. SANDERSON and L. M. PEAIRS (*New Hampshire Sta. Tech. Bul. 7 (1913), pp. 125, figs. 46*).—This bulletin presents details of studies, accounts based upon which have been previously noted (E. S. R., 20, p. 851; 23, p. 358). Part 1 (pp. 3–9) gives a history and descriptions of the work; part 2 (pp. 10–41) a summary of the conclusions and of illustrations; part 3 (pp. 42–93) a summary of all the data obtained at the New Hampshire Station, upon which the studies are based; and part 4 (pp. 94–125) temperature records.

The following conclusions have been drawn: "The velocity of development, within what may be termed the normal limits, depends, other factors being equal, upon the temperature. It increases directly with the temperature, the curve for the increase within normal limits being a true mathematical hyperbole. The factor or index of development for any point on this curve is the reciprocal for that point. Thus, the reciprocal curve includes all the indexes for the curve. This reciprocal, assuming that we are correct in our first conclusion, that the curve is always a true hyperbole, takes, by definition, the form of a straight line; the inclination of this line to the axes of the curve being governed by the rapidity of development of the insect and stage. The developmental zero for the insect and stage approximates the point where the reciprocal curve (calculated from the time factor) intersects the temperature axis. The thermal constant is the constant for the curve, that is, the product of the time and temperature factors. That is, for a hyperbole, always constant.

The curve for any stage of any insect at constant temperatures can be platted by the establishment experimentally of any two points, or, if the developmental zero be known, by the establishment of any one point.

"The foregoing conclusions are primarily for constant temperature conditions. While we have less proof, the data seem to show that for temperatures showing a daily variation the effective temperature is somewhat higher than the daily mean. On the other hand, when the change is not in the nature of a daily variation, but rather a change of constant temperatures for longer periods of time we find that the results work out properly for the original hyperbolic curve. . . .

"Finally, it must be borne in mind that all temperature factors and calculations involving them must be based on degrees above the developmental zero. This may be seen in the calculation of the thermal constant."

Utilization of certain phytophagous insects in combating the enemies of cultivated plants, A. VUILLET (*Rev. Sci. [Paris], 52 (1914), I, No. 17, pp. 526–530; abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 6, p. 345*).—A general discussion.

Some attempts to control injurious insects by means of their natural enemies, T. A. C. SCHOEVERS (*Tijdschr. Plantenziekten, 19 (1913), Nos. 3, pp. 91–96; 4, pp. 109–130; abs. in Rev. Appl. Ent., 1 (1913), Ser. A, No. 10, p. 376*).—A discussion of the subject with a summary of experimental work.

Proceedings of the Entomological Society of British Columbia (*Proc. Ent. Soc. Brit. Columbia, n. ser., No. 3 (1913), pp. 46*).—Among the more important papers here presented are Combination Sprays and Recent Insecticide Investigations, by H. F. Wilson (pp. 9–17); Methods of Taking Insect Records in the Field, by R. C. Treherne (pp. 21–24); Some Problems in Aphis Control, by L. L. Palmer (pp. 31–34); Two Injurious Insects of Economic Importance Attacking Peach, Apricot, and Plum Trees, namely, the peach twig moth and the peach borer, by W. H. Lyne (pp. 34–36); Cutworms and Their Control, by M. S. Middleton (pp. 36, 37); and The Economic Importance of Canadian Ipidæ, by J. M. Swaine (pp. 41–43).

Phytopathological report for the year 1913, P. MARCHAL (*Rev. Phytopath. Appl., 1 (1914), No 18–19, pp. 9–13; abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 7, pp. 420–422*).—This annual report (E. S. R., 30, p. 154) deals with the more important insects of the year.

Recent work of the Royal Entomological Station of Hungary, J. JABLONOWSKY (*Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 3, pp. 316–320*).—This is a discussion of work with control measures for insect pests and rodents, which was carried on during 1913.

[Observations on the insect enemies of field crops and orchards during 1913], V. V. DOBROVLIANSKY (*Khoziaistvo, 1914, No. 10, pp. 332–338; abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 6, pp. 341–343*).—This is a report of work conducted at the Kief Station during 1913.

The insect enemies and diseases of plants in the Government of Taurida during 1913, I. M. SHTCHEGOLEV (*Otchet Deiateln. Pomoshch. Gubern. Ent. [Taurida] Zemstva, 1913, pp. 24; abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 5, pp. 329–331*).—Among the pests mentioned as causing damage to plants during the year are the gipsy moth, *Hoplocampa brevis*, *Anthonomus pomorum*, the codling moth, *Eriocampa adumbrata*, *Luperus ruficpes*, *Chorcutis parialis*, etc.

Preliminary studies of the enemies of clover, G. DEL GUERCIO (*Atti R. Accad. Econ. Agr. Georg. Firenze, 5. ser., 11 (1914), No. 2, pp. 133–183, figs. 39*).—The more important insect enemies of Trifolium here discussed are the aphidids *Rizoberlesia trifolii* and *Aphis scaliæ* n. sp., *Apion* spp., and the clover root borer, *Hylastes trifolii*.

Some experiments with maize stored in bins, A. J. GROVE (*Agr. Jour. India, 9 (1914), No. 1, pp. 92–98*).—The author states that in tests made at the Pusa farm of the efficiency of naphthalin and carbon bisulphid in destroying insects in stored maize it was found that 1 lb. of flake naphthalin distributed in corn in cylindrical bins 6 ft. high by 3 ft. in diameter was practically as effective and more satisfactory to handle than fumigation with carbon bisulphid at the rate of 5 lbs. per 1,000 cu. ft.

Enemies of mustard and means of combating them, N. SACHAROV (*Abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 6, pp. 355–358*).—A preliminary report based on investigations at the Astrakhan Entomological Station.

Onion pests (*Wisconsin Sta. Bul. 240 (1914), pp. 44–46, figs. 2*).—In attempts to control the onion maggot (*Pegomya cepetorum*) which, together with the onion thrips, threatens the destruction of the onion crop in Wisconsin, experiments were made with sweetened arsenicals. For this purpose ½ pint of blackstrap molasses was added to 1 gal. of water and to this arsenical poisons were added, 1 gm. of sodium arsenite proving to be the most effective. It is stated that both sexes are very greedy for the sweets, and gorging themselves until their abdomens are greatly extended, are killed within three to ten hours after the ingestion of the poison.

Two insect pests of sugar beets from Turkestan new to Russia, E. M. VASSILIEV (*Viestnik Sakhar. Promysh., No. 3 (1914), pp. 68–75; abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 4, pp. 248, 249*).—This article relates to the injury caused by *Laphygma exigua* and *Phlyctænodes nudalis*.

Manual of fruit insects, M. V. SLINGERLAND and C. R. CROSBY (*New York, 1914, pp. XVI+503, figs. 396*).—This work, prepared in part by the senior author just prior to his death and completed by the junior author, treats of the more important insects injurious to deciduous fruits. In the preparation of this work the aim has been to give in as concise form as possible the main facts relating to the distribution, life history, and habits of the insect, the nature and extent of its injury, and means of control from the standpoint of the commercial fruit grower.

The first five chapters deal with apple insects and are followed by chapters on pear and quince, plum, peach, cherry, raspberry, blackberry, dewberry, currant, gooseberry, strawberry, grape, and cranberry insects, and insecticides.

The xylophagous insect enemies of the vine, J. FEYTAUD (*Rev. Vit., 41 (1914), Nos. 1046, pp. 5–7, pl. 1, figs. 2; 1047, pp. 41–45, figs. 7; 1049, pp. 94–99, figs. 3*).—This is a general account of the more important wood-attacking enemies of the grapevine in France.

Insects injurious to camphor (Cinnamomum camphora), A. RUTHERFORD (*Trop. Agr. [Ceylon], 42 (1914), No. 6, pp. 463–468*).—The enemies of the camphor tree in Ceylon include a thrips, probably *Cryptothrips floridensis;* a leaf miner (*Acrocercops* sp.); the large bagworm (*Clania variegata*); a bagworm, probably *Amatissa consorta;* and *Xyleborus compactus*.

The most common insects pests of pine and fir cones, I. TRÄGÅRDH (*Skogen, 1 (1914), No. 2, pp. 42–50, figs. 5; abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 4, pp. 242, 243*).—The author discusses the injury caused in Sweden by *Pissodes validirostris, Grapholitha (Laspeyresia) strobilella, Phycis (Dioryctria) abietella*, an undetermined chalcidid of the genus Megastigmus, etc.

Ants and bees as carriers of pathogenic micro-organisms, W. M. WHEELER (*Amer. Jour. Trop. Diseases and Prev. Med., 2 (1914), No. 3, pp. 160–168*).—A paper read before the American Society of Tropical Medicine, at Boston in May, 1914, in which the author presents a general discussion of the subject.

Destruction of locusts in Turkestan, J. P. BARSACQ (*Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 4, pp. 558–564*).—

An account of the campaign against locusts in Turkestan, including mechanical and chemical means, and a discussion of natural enemies.

The Morocco locust (*Stauronotus maroccanus*) is the most important species. The migratory locust (*Pachytylus migratorius*) possesses several permanent areas of distribution in Central Asia but this species rarely damages crops, preferring the shoots of reeds which occur in abundance near the egg-laying areas. The Italian locust (*Caloptenus italicus*) is a common species in Turkestan but until recently has only caused a small amount of injury. A number of other species are injurious though not to the same extent as the three above mentioned.

A note on the relation between the tea mosquito (Helopeltis theivora) and the soil. E. A. ANDREWS (*Indian Tea Assoc., Sci. Dept. Quart. Jour., No. 1 (1914), pp. 31–35*).—Investigations of the factors controlling the activities of the tea mosquito in causing blight indicate that tea planted in soil in which the ratio of available potash to available phosphoric acid is low will be more likely to be attacked by mosquito blight than tea planted in soil in which this ratio is high. It is suggested that this condition may be remedied by the application of potash manures.

Aleurodes vaporarium, an enemy of Azales indica. VAN HOVE (*Rev. Hort. Belge, 39 (1913), No. 24, pp. 392, 393; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 3, p. 417*).—This white fly, which is well known to Belgian azalea growers, is said to have been very abundant in the autumn of 1913.

A new sugar cane aphis. H. F. WILSON (*Ent. News, 25 (1914), No. 7, pp. 298, 299, pl. 1*).—An aphidid collected on sugar cane at New Orleans, La., is described as *Aphis bituberculata* n. sp.

European caterpillars and their food plants. P. BLASCHKE (*Die Raupen Europas mit ihren Futterpflanzen. Annaberg, Germany, 1914, pp. [14]+XXIX+264+75, pls. 34*).—The first part of this work (pp. 1–264) consists of a caterpillar calendar in which are given brief descriptions of the European forms, notes on their occurrence and food plants from month to month, etc. The second part (pp. 1–75) lists alphabetically and describes the food plants with the caterpillars occurring on each. Indexes to the German and technical names of the lepidopterans and the German names of the food plants are appended to the two parts.

Six colored plates of caterpillars representing 156 species and 28 colored plates of food plants in bloom, with indexes to both, are included.

Instructions for rearing mulberry silkworms. M. N. DE (*Agr. Research Inst. Pusa Bul. 39 (1914), pp. 25, pls. 4, figs. 3*).—A work prepared for use by those engaged in silk culture.

Grapholitha leplastriana, an enemy of cauliflower. G. CECCONI (*Bol. Lab. Zool. Gen. e Agr. R. Scuola Sup. Agr. Portici, 7 (1913), pp. 125–148, pl. 1; abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 6 pp. 347, 348*).—The caterpillar of this moth, supposed to live on wild cabbage (*Brassica oleracea silvestris*) exclusively, has been found by the author to attack cauliflower at Fano in the Province of Marches.

Borer in san. M. M. DESAI (*Poona Agr. Col. Mag., 6 (1914), No. 1, pp. 39, 40*).—During the course of a rotation experiment with san as a green manure crop it was seriously injured by the attack of an undetermined lepidopterous larva which bores into the buds and shoots. Caterpillars of *Argyna cribrasia* were also a source of injury.

Miscible oil spray for fruit tree leaf roller (Archips argyrospila). G. P. WELDON (*Mo. Bul. Com. Hort. Cal., 3 (1914), No. 7, pp. 285, 286, fig. 1*).—

Larvæ failed to hatch out from egg masses of *A. argyrospila* treated with miscible oil applied at the rate of 1:20.

Borer in jowar, M. M. DESAI (*Poona Agr. Col. Mag., 6 (1914), No. 1, pp. 41–43*).—The sugar borer *Chilo simplex* is reported to have injured the jowar or Indian millet crop which is a staple human food and also a great source of fodder for cattle in the Surat District.

A light trap for catching cutworm moths, G. P. WELDON (*Mo. Bul. Com. Hort. Cal., 3 (1914), No. 7, pp. 284, 285, fig. 1*).—An illustration is given of a trap used in sugar beet fields at Oxnard, Cal. This consists of a shallow galvanized iron pan about 4 ft. in diameter set on a platform a few feet above the ground, over which is hung a gas burner inclosed in a globe and connected with a tank within the frame, in which acetylene gas is generated.

It is stated that on the morning of May 18 from 1,200 to 1,500 moths were found to have been trapped during the night. A trap placed on a beet dump with an electric light to attract the moths is said to have caught as high as 7,000 moths during a single night. Most of the moths are said to represent the cutworm species *Peridroma saucia*.

The Hessian fly in Missouri, L. HASEMAN (*Missouri Sta. Circ. 70 (1914), pp. 21–24, fig. 1*).—A brief popular account of the Hessian fly, the most destructive enemy of wheat in Missouri.

Natural enemies of Simulium.—Notes, F. M. WEBSTER (*Psyche, 21 (1914), No. 3, pp. 95–99*).—The author here brings together miscellaneous notes on personal observations of the natural enemies of Simulium.

A new schizogregarine (Caulleryella aphiochætæ n. g. and n. sp.), an intestinal parasite of the larva of a cyclorrhaphous dipteran (Aphiochæta rufipes), D. KEILIN (*Compt. Rend. Soc. Biol. [Paris], 76 (1914), No. 16, pp. 768–771, figs. 12*).—A report of studies of a gregarine found in the intestines of a phorid (*A. rufipes*).

Leprosy: Flies in relation to the transmission of the disease, J. A. HONEIJ and R. R. PARKER (*Jour. Med. Research, 30 (1914), No. 2, pp. 127–130*).—This is a preliminary report of studies conducted at the Penikese Hospital Laboratory.

Of 95 flies used in the work, 59 were *Musca domestica*, 3 *Muscina stabulans*, 30 *Stomoxys calcitrans*, 2 *Lucilia* sp., and one an undetermined sciomyzid. The study shows that a fly will feed continuously for from 3 to 31 minutes; that the digestive tract was completely emptied in from 52 to 72 hours; that the average number of excreta deposits was for the *M. domestica* male during 46 hours 25+ and for the female 35+ (during the first 24 hours the greatest number of ejections occurred and after the first 8 hours), and for the *S. calcitrans* male during 61 hours 40+ and for the female 86+ (during the first 24 hours the greatest number of ejections occurred and after the first 3 hours); and that the average time after feeding before the first ejection varies considerably between 5 and 45 minutes, but the average is about 13 minutes. "It was found that of 12 flies of different species caught in the rooms of patients only 2 (*M. domestica*) showed the acid-fast bacilli in the excreta deposits, and that of 6 flies (also *M. domestica*) allowed to feed on the lesions of patients the excreta gave negative results. . . . From the 41 flies fed on the contents of pustules the best results were obtained. Of 21 flies (*M. domestica*) 15 were negative and 6 positive. Of *S. calcitrans* 20 were used which gave 4 negative and 16 positive results. Of another series of six flies (three of each species), two gave positive findings, two questionable acid-fast bacilli, and two were negative. . . . In no other species of flies other than *M. domestica* and *S. calcitrans* were the acid-fast bacilli found in the excreta."

Adia genitalis and Leptohylemyia coarctata, N. V. KURDIUMOV (*Trudy Poltav. Selsk. Khoz. Opytn. Stantsii, No. 21 (1914), pp. 43, figs. 27; abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 6, pp. 350–353*).—A report of studies from the Poltava Station of two dipterous enemies of wheat.

An investigation into the relationship of the house fly to disease—the special importance of the fly in infant welfare, D. B. ARMSTRONG (*Amer. Jour. Pub. Health, 4 (1914), No. 3, pp. 185–196*).—The author presents the results of preliminary investigations carried on in New York City by the Bureau of Public Health and Hygiene, and in conclusion states that the Bureau is convinced of the necessity of continuing the studies on a larger, more comprehensive, and complete scale for at least one other fly season before definite positive conclusions can be reached.

Combating elaterid larvæ, D. BORODIN (*Khutorianin, No. 12 (1914), p. 382; abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 6, p. 344*).—The author states that elaterid larvæ may best be combated by poisoned or other baits, consisting of slices of potatoes, carrots, beets, oil cakes, cabbage stalks, etc., buried in various parts of the field to a depth of 3 or 4 in. "These baits are poisoned by adding to them either Paris green or arsenic, in which case they need no further attention. In case of unpoisoned baits they must be inspected practically every week and the larvæ found on them destroyed with boiling water. [The author] also recommends maize baits, prepared as follows: About 0.25 lb. of white arsenic and 2.5 lbs. of maize well boiled in about 2.5 gals. of water, care being taken not to inhale the vapor. The baits can be best used in autumn and spring, before sowing or even afterwards, so long as the seedlings are not too high."

Orchard bark beetles and pin hole borers, H. A. GOSSARD (*Ohio Sta. Bul. 264 (1913), pp. 68, figs. 22*).—This bulletin reports studies carried on in cooperation with the Bureau of Entomology of this Department, represented by H. F. Wilson, who was stationed in the infested region during the spring, summer, and fall of 1908, a report by whom on the peach bark beetle has been previously noted (E. S. R., 20, p. 955). The investigation was continued by L. L. Scott in the summer of 1909, by R. D. Whitmarsh during the seasons of 1910 and 1911, and by J. L. King during the seasons of 1912 and 1913.

The fruit bark beetle (*Eccoptogaster rugulosus*) is first dealt with (pp. 6–30). This pest, often called the shot hole borer, is the most common and attacks nearly all species and varieties of orchard fruits. The peach bark beetle, which ranks second in importance in Ohio, is next taken up at length (pp. 31–59). A few other nearly related species, known as pin hole borers, have somewhat similar habits but are of minor importance. These considered, briefly, are the banded pin hole borer (*Monarthrum fasciatum*), the apple pin hole borer, or apple strainer (*M. mali*), and the pear blight beetles *Xyleborus dispar* and *X. pyri*. These pin hole borers made their burrows in the heartwood, but the external openings through the bark resemble the exit holes of the shot hole beetles, except that they are smaller. The twig borers, namely, the apple twig borer (*Amphicerus bicaudatus*) and the red shouldered sinoxylon (*Sinoxylon basilare*) are also briefly noted.

The biologies of the fruit and peach bark beetles are summarized by the author as follows: "There are two broods per season of the fruit bark beetle (*E. rugulosus*), the adults of the first brood appearing during the latter half of May, and in maximum numbers during the first half of June, the brood being practically over by that time, though a few females linger for a month longer. Eggs are laid in a few days after the appearance of the females and hatch in three or four days. Each female deposits from 30 to over 100 eggs, with an average of about 75 to 90. The larvæ mature in 30 to 36 days after

hatching and pupate in the burrows. The pupal period lasts from seven to ten days, and the beetles of the second brood commence to appear about the middle of July and continue to issue until late August or early September. Some of the beetles of this brood may linger until late October. The progeny of this brood hibernate as larvæ in the bark and develop into the early brood of beetles the next May and June.

"The peach bark beetle hibernates in the beetle form in special cells in the bark, becoming active in late March and early April. The beetles at once commence excavating burrows in dead or living wood, but use only dead or dying wood for incubation burrows. They commence laying eggs about the twentieth of April and each female will, under normal conditions, deposit from 80 to 160 eggs. These eggs hatch in a few days and the larvæ require 25 to 30 days to become grown. The pupal period extends over four to ten days, and the beetles of the summer brood appear about the middle of July, maximum emergence occurring during the latter part of August. Beetles continue to appear irregularly until October. The progeny of this brood of beetles are larvæ during the fall months and mature as beetles upon the approach of cold weather, but do not leave their hibernation cells until the following spring."

The remedial measures are summarized as follows: "Probably the most important measure to prevent multiplication of all these beetles is to burn promptly all prunings, dead wood, and dying trees. Attacked orchards can be successfully reclaimed from attack by cultivation, by liberal fertilization with barnyard manure and commercial fertilizer, and by whitewashing or spraying with carbolized soapy mixtures. Treatment should commence in the spring. Prune severely, spray before the leaves appear, and apply a heavy coat of whitewash to the trunks and larger branches in early April. Cultivate and fertilize as soon as the ground is in suitable condition; apply a second coat of whitewash or other repellent in early July and a third about September 1. Apply thick whitewash with a broom; thin mixture may be applied with a spray pump, but should be repeated until a good coating is secured."

Orchard bark beetles and pin hole borers, H. A. GOSSARD (*Ohio Sta. Circ. 140 (1913), pp. 16, figs. 10*).—This is an abridgment of the bulletin noted above.

[Studies of Sciaphobus squalidus at the Poltava Agricultural Experiment Station], A. V. ZNAMENSKIĬ (*Trudy Poltav. Selsk. Khoz. Opytn. Stantsii, No. 20 (1914), pp. VI+32, pls. 2, figs. 5; abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 6, pp. 337–339*).—This paper presents the results of three years' work on this weevil enemy of fruits, its bionomics, enemies, etc.

Note on a chalcidid parasite of the pea thrips [Frankliniella robusta], A. VUILLET (*Compt. Rend. Soc. Biol. [Paris], 76 (1914), No. 13, pp. 552–554, figs. 3*).—A new parasite reared from *F. robusta* in France during the season of 1913 is described as *Thripoctenus brui*. Reference is made by the author to the work by Russell, previously noted (E. S. R., 27, p. 262).

The acrobat ant (*Agr. News [Barbados], 13 (1914), No. 323, p. 298*).—An undetermined species of the genus Cremastogaster is said to be injurious to trees in the Lesser Antilles, chiefly by preventing cuts in the bark from healing over. In addition to the injury to trees, they seem to hasten the decay of timber in buildings.

The sheep tick (*Jour. Dept. Agr. So. Aust., 17 (1914), No. 9, pp. 904–909, figs. 4*).—This article consists of accounts of (1) the life history of the sheep tick (*Malophagus ovinus*) by F. E. Place, (2) its effect on sheep by H. Jackson, and (3) the occurrence of the tick in South Australia by T. H. Williams.

Eriophyes ribis on Ribes nigrum, MISS A. M. TAYLOR (*Jour. Agr. Sci. [England], 6 (1914), No. 2, pp. 121–128*).—A report of studies of the life history and habits of the black currant mite and the injury which it causes.

Eriophyes ribis on Ribes grossularia, Miss A. M. Taylor (*Jour. Agr. Sci. [England], 6 (1914), No. 2, pp. 129–135, fig. 1*).—The author reports that during 1912 gooseberries were seriously deformed by an attack of Eriophyes. When attacked by this mite the leaves and shoots of the gooseberry (*R. grossularia*) are severely blistered and deformed, whereas the black currant (*R. nigrum*) shows no sign of injury. No phenomenal growth of the buds of the gooseberry takes place when attacked, whereas the black currant develops abnormal buds, known as "big buds."

"Migration by the agency of the wind is the general method of distribution employed by the mite on *R. nigrum*. The same habit is observed to a limited extent on *R. grossularia*, the general method being that of crawling from the scale leaves of the attacked bud to the shoot developing from it."

FOODS—HUMAN NUTRITION.

Bacteriological methods for meat analysis, J. Weinzirl and E. B. Newton (*Amer. Jour. Pub. Health, 4 (1914), No. 5, pp. 408–412*).—The results are reported of the development of a method for determining the bacterial content of meat, in which the meat was ground in a mortar with sterile sand and normal salt solution to obtain an emulsion for inoculation into the culture media.

Bacteriological analyses of hamburger steak with reference to sanitary conditions, J. Weinzirl and E. B. Newton (*Amer. Jour. Pub. Health, 4 (1914), No. 5, pp. 413–417*).—Employing the method described above, the authors determined the bacterial content of 44 samples of market hamburger steak. Comparisons were also made of the value of the organoleptic test, the ammonia test, and the bacterial content in determining the degree of decomposition of the meat.

The conclusions drawn are in part as follows:

The standard of 1,000,000 bacteria per gram, advocated by some as a limit, is apparently too low, since it would condemn nearly all samples of hamburger, when showing no taint or other evidence of putrefaction. Samples of other market meats, all of which would otherwise pass inspection, often exceed this limit.

The organoleptic and the ammonia tests agree fairly well, but as meat may be actually putrid and may contain millions of bacteria per gram before responding to them, they appear to be too liberal, and a stricter standard would be desirable.

A bacterial standard of 10,000,000 per gram as the limit is proposed, on the basis of which 50 per cent of the market samples of hamburger would still be condemned. This is justified on the following grounds: (a) Much of it is actually spoiled when it reaches the consumer or is to be cooked; (b) meat teeming with 10,000,000 bacteria per gram is potentially rotten and soon will be actually spoiled under ordinary methods of handling; (c) the fact that markets are prone to add sodium sulphite to hamburger, even though the dealer knows it to be contrary to law, indicates that something is wrong with the hamburger; and (d) finally, if hamburger were made from wholesome meat in the first place, then kept properly iced, it is believed that the bacterial content could readily be held within the 10,000,000 limit.

Studies of bouillon cubes, P. Saccardi (*Arch. Farmacol. Sper. e Sci. Aff., 17 (1914), No. 5, pp. 229–240*).—Analytical data are given concerning several commercial brands of bouillon cubes. Determinations were made of potassium, chlorin, phosphoric acid, and iron as well as of water, total organic matter, nitrogen fat, and ash.

The decline in the gluten content of flour, BALLAND (*Jour. Pharm. et Chim., 7. ser., 9 (1914), No. 10, pp. 510–514*).—Statistical data are summarized and briefly discussed.

The bacterial content of flour, L. DIETZEL (*Ueber den Bakteriengehalt des Mehles. Inaug. Diss., Univ. Würzburg, 1912, pp. 26; abs. in Hyg. Rundschau, 24 (1914), No. 9, p. 535*).—Experimental methods are described. The author did not determine the nature of the micro-organisms isolated.

Cause of the poor baking quality of flour from wheat and rye of the 1913 harvest, H. KÜHL (*Ztschr. Öffentl. Chem., 20 (1914), No. 9, pp. 162–167*).—Bacterial contamination of the samples was very noticeable, and the author studied the possible relation of this factor to the quality of the bread.

Municipal bread making in Catania, G. DE F. GIUFFRIDA (*Municipalizzazione del Pane a Catania. Milan, 1913, pp. 244*).—This book treats extensively of the various aspects of municipal bread making in general, and in detail discusses the practice as carried out in the Province of Catania, Italy.

Among the subjects herein treated are a historical review of the development of municipal bread baking and its economical and social aspects, including its influence upon labor conditions, social hygiene, and price of bread.

Cotton-seed flour as a possible food for man, C. A. WELLS (*Jour. Indus. and Engin. Chem., 6 (1914), No. 4, pp. 338, 339*).—Although cotton-seed flour is high in protein, the fact is pointed out that it has no gluten-like substance and that therefore it must be mixed with wheat flour in bread making. The author regards cotton-seed flour as an economical source of protein. Though in his experience the use of limited amounts has proved wholesome, he notes that, reasoning from what has been observed in experiments with animals, large amounts might have deleterious effects, and states that the question of the toxicity of cotton-seed meal is under investigation.

Rice and rice cookery, MIRIAM BIRDSEYE (*Cornell Reading Courses, 3 (1914), No. 55, pp. 85–103, figs. 10*).—General information is given regarding the growing of rice, the rice industry, and the nutritive value and preparation of rice for the table, together with a number of recipes.

Food poisonings due to creamed cabbage, E. DESESQUELLE (*Bul. Sci. Pharmacol., 21 (1914), No. 4, pp. 199–204*).—The author gives a digest of data regarding cases of food poisonings due to eating various creamed preparations. From the investigations carried out by a number of authors, the following recommendations for making various cream preparations or custards have been formulated:

Only boiled milk and strictly fresh eggs without the least suggestion of bad odor should be used. The yolks should be mixed with milk at the highest possible temperature which will not injure the preparation. The utensils used in the preparation of these foods should be thoroughly washed in boiling water before using. All added substances, for example gelatin, should be dissolved, if possible, in boiling water. The hands of the worker should be previously washed and covered with clean gloves during the preparation of the food.

Tropical vegetable foods, H. H. RUSBY (*Jour. N. Y. Bot. Gard., 15 (1914), No. 173, pp. 107–112*).—This is an abstract of a lecture delivered at the New York Botanical Gardens, which summarizes information regarding the consumption of different vegetable foods in the countries of the world having a tropical climate.

The cooking of vegetables, C. H. SENN (*Jour. Roy. Hort. Soc., 39 (1914), No. 3, pp. 523–529*).—In this paper the author discusses particularly the characteristics and preparation for the table of "stem vegetables," such as asparagus,

celery, leek, and sea kale, and gives a number of recipes. See also a previous note (E. S. R., 29, p. 566).

Hardened oils, G. MEYERHEIM (*Fortschr. Chem., Phys. u. Physikal. Chem., 8 (1913), No. 6, pp. 293–307*).—A digest of data, including the literature of patents, regarding the formation of solid, saturated fats from unsaturated, liquid fats, hydrogen being added by means of a catalyzer. Though written from the standpoint of the soap making industry, this article is also of interest to students of nutrition since similar hardened fats are manufactured for culinary purposes.

Preserved foods and candies, A. HAUSNER (*Die Fabrikation der Konserven und Kanditen. Vienna and Leipsic, 1912, 4. ed., rev. and enl., pp. VIII+332, figs. 47*).—The author states that this edition of his handbook has been revised and enlarged.

A contribution to the knowledge of coffees, I. RÓZSÉNYI (*Chem. Ztg., 37 (1913), No. 145, pp. 1482–1484*).—Data are here given regarding several varieties of coffees including among others Porto Rico, Mocha, Ceylon, Santos, and Domingo coffees. Potassium, sodium, calcium, magnesium, and iron were determined as well as water and total mineral matter.

The volatile constituents of coffee, J. ABELIN and M. PERELSTEIN (*München. Med. Wchnschr., 61 (1914), No. 16, pp. 867, 868*).—The nature of and the physiological effects produced by the volatile constituents of coffee, as shown by other workers, are discussed, and the authors present the results of a quantitative study of the volatile matter obtained by steam distillation from several samples of ordinary coffee and a so-called "treated" coffee from which a part of these constituents had been removed by a patented process.

Electric cooking (*Austral. Mining Standard, 50 (1913), No. 1291, p. 116*).—A description is given of an electric stove in which the heat is obtained and distributed by numerous rods of a cheap and durable metal which is unaffected by heat, instead of by means of the series of wires ordinarily employed. The rods may be easily replaced and only as many as are required need be in operation, since each rod is an independent unit.

Electric cooking on the battleship "Texas" (*Elect. World, 63 (1914), No. 20, pp. 1099, 1100, figs. 3*).—A description is given of the electric cooking apparatus which is used for the preparation of all the food for the officers and men except for boiling meats and vegetables and preparing tea and coffee, which processes are carried out in steam jacketed caldrons. Menus are given showing the food prepared for one week.

Electric cooking, W. H. ALABASTER (*Elect. Rev., 73 (1913), No. 1869, pp. 451–454, figs. 5; abs. in Sci. Abs., Sect. B—Elect. Engin., 16 (1913), No. 192, p. 590*).—The author discusses and summarizes in tabular form data regarding the amount of energy required with electrical ovens of different makes to secure a temperature of 400° F. and maintain it for 1½ hours, and regarding the comparative efficiency of different sorts of hot plates when used to raise the temperaturs of 3 pts. of water to boiling, as well as the weekly cost of cooking for a family of 2 adults and 2 children when different cooking devices are used.

Gas cooker efficiencies (*Jour. Gas Lighting, 126 (1914), No. 2662, p. 493*).—The results are reported of comparative efficiency tests of ordinary gas ovens and hot plates and of improved types. The details of the improvements embodied in the types of cookers described are not given but apparently consist chiefly of a better regulation of the volume and direction of the air supply.

A story of certain table furnishings, CLARA W. BROWNING and EDITH J. MUNSELL (*Cornell Reading Courses, 3 (1913), No. 51, pp. 49–72, figs. 28*).—Historical data are summarized regarding the origin and development of table equipment.

A proper newe booke of cokerye, edited by CATHERINE F. FREBE (*Cambridge, 1913, pp. CLXIV+124, pls. 2*).—The reprint of this sixteenth century cookbook, which gives some information regarding dietetics as well as data concerning the preparation of food at this time in England, is preceded by an introduction by the editor, and also contains a glossary-index and a bibliography of culinary literature, particularly earlier publications.

Regulation of hotel and restaurant kitchens [in Germany], R. P. SKINNER (*Daily Cons. and Trade Rpts. [U. S.], 17 (1914), No. 123, p. 1117*).—According to this report, while regulations exist for governing the sanitary condition of restaurant and hotel kitchens, there is no regular system of police inspection except when licenses are granted or complaints are entered. The condition of such places is attributed to the care of the proprietors.

[The presence of tobacco in foods] (*Weekly Rpt. Bd. Health Cincinnati, 5 (1914), No. 19, pp. [1, 2], fig. 1*).—A statement is made regarding the finding of tobacco in bread and the desirability is pointed out of more strictly enforcing the regulation which prevents the use of tobacco in bake shops.

Work in the hygiene of food and nutrition of the Prussian Board of Health in 1911 (In *Das Gesundheitswesen des Preussischen Staates im Jahre 1911. Berlin, 1912, pp. 364–399; summarized in Ztschr. Öffentl. Chem., 20 (1914), Nos. 1, pp. 6–13; 2, pp. 21–23*).—An account of the work carried on, particularly with reference to general nutrition, animal foods, vegetable foods, and condiments.

Cases of food poisoning noted in the German Army during the last two years, W. SEELE (*Ueber die in der Deutschen Armee in den letzten zwölf Jahren vorgekommenen Nahrungsmittelvergiftungen. Inaug. Diss., Univ. Berlin, 1913, pp. 29; abs. in Hyg. Rundschau, 24 (1914), No. 9, pp. 531, 532*).—The data summarized shows that meat and sausage were the most common sources of food poisoning as is natural enough when one recalls that such food is taken daily. Potatoes, and particularly potato salad, are next in order. Other materials, particularly cooked foods containing flour, also cause poisoning.

The inciting of the trouble was not always the same, but the following microorganisms were identified: *Bacillus coli communis, B. proteus, B. enteritidis,* and *B. paratyphosus.* In the case of potatoes the poisoning was attributed in some instances to a high solanin content and in others to *B. proteus.* The majority of the poisonings occurred in the months of April and May.

The etiology of beri-beri, R. P. STRONG and B. C. CROWELL (*Trans. 15. Internat. Cong. Hyg. and Demogr. Washington, 5 (1912), Sect. 2, pp. 679–696*).—The authors give some data regarding the work of other investigators and summarize the results of their own experimental studies of the subject with prisoners in Bilibid prison, in Manila.

Some groups were fed, as the principal article of diet, white rice for varying lengths of time, and other groups, white rice plus an alcoholic extract of rice polishings, the period the experiment covered being from 97 to 117 days. It was planned to supply one group with white rice and rice polishings cooked together, but it was found that the subjects would not eat this food.

Quotations from the authors' findings and conclusions follow:

"It is evident that among the individuals comprising our experiment beri-beri was produced only by means of the diet, and that the disease has therefore a true dietetic causation. It is further evident from our experiments that beri-beri develops owing to the absence of some substance or substances in the diet necessary for the normal physiological processes of the body. Without the supply of such substances in the food, beri-beri results. Such a substance or such substances are evidently present in red rice and in rice polishings, and also in small amount in the alcoholic extract of rice polishings, and when

these articles are added to what would appear to be an otherwise physiologically proper diet they usually prevent the development of the symptoms of the disease. In some instances, however, even when these substances are constituents of the diet, when the diet is without variation and composed of very few articles, and the individual suffers from loss of appetite and the assimilative functions appear to be poor and he loses markedly in weight, symptoms of beriberi may develop. However, such symptoms may be dispersed by causing a variation in the diet by the addition of other nutritious substances."

"None of the individuals in our experiments developed symptoms suggesting scurvy. . . .

"From our experiments there is no evidence of any nature which suggests that beri-beri is an infectious disease, and on the contrary the evidence is definite that beri-beri [in the Philippine Islands] is due to the prolonged consumption of a diet which lacks certain substances necessary for the normal physiological needs of the human body."

The authors also discuss the possible relation of the phosphoric acid content of rice to the incidence of beri-beri.

The prevention of beri-beri, E. B. VEDDER (*Trans. 15. Internat. Cong. Hyg. and Demogr. Washington, 5 (1912), Sect. 2, pp. 671–678*).—The author discusses the relation of beri-beri to polished rice, and gives his reasons for believing that the solution of the difficulty does not lie in placing a tax on highly milled rice.

The protective power of normal human milk against polyneuritis gallinarum (beri-beri), R. B. GIBSON (*Philippine Jour. Sci., Sect. B, 8 (1913), No. 6, pp. 469–471*).—In view of the fact that infantile beri-beri has been attributed to a deficiency of "vitamins" in the milk of the mother resulting from the too exclusive consumption of milled rice, the author carried out a series of experiments to study the protective power of normal human milk against beri-beri. Four groups of fowls were fed 50 gm. of polished rice per day, in addition to which some of the fowls received human milk in quantities varying from 5 to 20 cc. The results of these experiments indicate that the addition of human milk to the polished rice, even in as large amounts as 20 cc. per day, was not sufficient to prevent polyneuritis.

It would appear from the work of other investigators here reviewed that fresh cow's milk had about four times the protective power of normal human milk.

A consideration of certain foods and of proximity to a previous case as factors in the etiology of pellagra, J. F. SILER, P. E. GARRISON, and W. J. MACNEAL (*Proc. Soc. Expt. Biol. and Med., 11 (1914), No. 3, p. 94*).—A statistical study was made of the foods used and the occurrence of pellagra in mill villages including about 5,000 persons.

According to the authors, the results obtained "failed to reveal any consistent relationship between the use of any particular food and the occurrence of pellagra. A somewhat similar statistical study of the location of domicile of old cases of pellagra in relation to domicile of the remaining population in these same mill villages has shown that new cases of pellagra developed almost exclusively in persons living in the same house with such antecedent cases or in houses next door to them, . . . a phenomenon which can be satisfactorily explained, in our opinion, only by assuming that pellagra is an infectious disease. Apparently it is not readily transmitted to any considerable distance."

Anaphylactic reaction in pellagra patients, by the inoculation of watery extract of spoiled maize, G. VOLPINO ET AL. (*Trans. 15. Internat. Cong. Hyg. and Demogr. Washington, 2 (1912), Sect. 1, pp. 344–346*).—A brief summary of the results of the authors' observations on inoculating pellagra patients with an

aqueous extract of spoiled maize. The authors state that the reaction was marked and found to be different from that observed when sound persons were similarly inoculated.

They state, further, that "the hypersensibility which manifests itself in pellagra patients owing to the inoculation of this watery extract of spoiled maize has particular characters which can not be found in any proportion through the injection of extract of sound maize."

The paper is followed by a discussion.

Concerning factors of toxicity and an excessive corn diet, E. CENTANNI and C. GALASSI (*Sperimentale, 67 (1913), No. 4, Sup., pp. 142–150; abs. in Zentbl. Expt. Med., 5 (1914), No. 7, p. 296*).—In this contribution to pellagra, the conclusion is reached, from extended experiments with laboratory animals (guinea pigs and mice), that an excessive maize diet is responsible for illness, and not the photodynamic properties of corn.

Pellagra in the Province of Rome, G. ALESSANDRINI, A. GIANNELLI, and E. FILENI (*Policlin., Sez. Prat., 20 (1913), No. 34, pp. 1213–1221, figs. 2; abs. in Hyg. Rundschau, 24 (1914), No. 9, p. 534*).—The conclusion was reached that in this Province there was no connection between corn diet and the occurrence of pellagra. On the other hand, there was apparently a relation between this disease and the water used.

Food requirements, appetite, and hunger—a dietary study, W. STERNBERG (*Das Nahrungs Bedürfnis der Appetit und der Hunger—Eine diätetische Studie. Leipsic, 1913, pp. XII+179*).—In this volume the author discusses food requirements, appetite, and hunger, under physiological and pathological conditions. A large amount of data is summarized and discussed exhaustively.

Changes in food supply and diet of the proletariat, M. RUBNER (*Wandlungen in der Volksernährung. Leipsic, 1913, pp. 4+135*).—In this volume the author discusses the effect of changing conditions on diet, especially with reference to the man of small means.

The questions considered in the various chapters are the following: The need for state supervision of the general question of diet; insufficient food; the increased cost of foodstuffs in its relation to food deficiency, to living conditions, and to social relations; the question of dietary standards; the determination of dietary conditions; changes in labor production; changes in food consumption; the protein and meat question from a physiological standpoint; the value of vegetable foods as a source of protein; the effect on dietetics of social influences; lowering the protein in the diet; sandwiches as a principal article of diet; the extent of meat consumption; and suggestions as to improving the diet of the proletariat.

The author brings together a large amount of important data in this volume, including the results of his experience and experiments. The volume as a whole constitutes an important contribution to the literature of dietetics which no student of the subject should overlook.

Experimental variations in the function of diet, A. MAGNAN (*Variations expérimentales en fonction du régime alimentaire. Thesis, Paris, 1913, No. 7; abs. in Presse Méd. [Paris], 1914, No. 19, p. 18; Zentbl. Expt. Med., 5 (1914), No. 9, pp. 409, 410*).—Some of the conclusions follow which the author reached with different kinds of animals:

Vegetable diet increases the surface of the digestive tract, while meat diet reduces it. A similar effect is noted in the small and large intestine. The weight of the intestine is greatest in animals which take solid food, and is ascribable to a thickening of the muscle walls. In birds, the weight and surface area of the stomach are proportional to the volume of the diet. As regards

chemical action, the liver and kidneys are relatively twice as large in fish-eating and insect-eating as in carnivorous and herbivorous animals.

The minimum requirement of protein supplied by a bread diet, M. HINDHEDE (*Skand. Arch. Physiol., 31 (1914), No. 4–6, pp. 259–320*).—The author reports the results of a series of digestion experiments from which he draws the following conclusions:

The minimum protein requirement is about the same for bread and potatoes and is in the neighborhood of 20 gm. of digestible protein for 3,000 calories. Potato and bread protein appear to have about the same value as meat protein and can replace the body tissue gram for gram. See also a previous note (E. S. R., 31, p. 263).

Protein requirement and the food value of meat, KISSKALT (*München. Med. Wchnschr., 61 (1914), No. 20, pp. 1121, 1122*).—The author believes in a generous protein ration as opposed to the paper noted above.

Calcium deficiency in the diet, R. EMMERICH and O. LOEW (*Ztschr. Hyg. u. Infektionskrank., 77 (1914), No. 2, pp. 311–328*).—Data from their own investigations and those of others are summarized, which led the authors to conclude that the calcium content of the daily food may vary within wide limits on a mixed diet and that there is a possibility of calcium deficiency. In some localities there is a marked decrease in the use of milk and vegetables, the foods which are richest in calcium, while there is a corresponding increase in meat, potatoes, and bread, and other foods made from flour, which are poorest in this constituent. Such conclusions have led the authors to recommend the addition of calcium chlorid to flour in bread making. See also a previous note (E. S. R., 29, p. 565).

Concerning calcium bread advocated by Emmerich and Loew, KUNERT (*Ztschr. Gesam. Getreidew., 6 (1914), No. 4, pp. 73–80*).—A critical discussion of the work noted above.

On age and metabolism and the significance of the excretion of creatin, R. A. KRAUSE (*Quart. Jour. Expt. Physiol., 7 (1913), No. 1, pp. 87–101; abs. in Zentbl. Expt. Med., 5 (1914), No. 8, p. 350*).—According to the author's observation, the urine of children on a creatin-free diet contained creatin. This condition ceases with boys in the fifth and sixth year, but continues longer with girls. The amount of creatin nitrogen in millimeters per kilogram of body weight is much smaller with children than with adults, increasing rapidly through the earlier years and then more slowly. When given to children per os in even small quantities part was excreted.

The conclusion was reached that children have less ability to break down creatin than adults, and that creatin is to be regarded as an intermediary product of metabolism which can be further utilized under normal conditions. The appearance of creatin in urine is dependent upon whether the process of creatin formation or creatin destruction dominates, a condition similar to that found with uric acid.

On the influence of preliminary heating upon peptic and tryptic proteolysis, A. H. BIZARRO (*Jour. Physiol., 46 (1913), No. 3, pp. 267–284, figs. 6; abs. in Zentbl. Physiol., 28 (1914), No. 2, pp. 101, 102*).—Artificial digestion experiments were made with egg white, fibrin, gelatin, beef, and casein. No definite conclusions could be drawn as to the digestive power of trypsin, but the experiments afforded additional evidence that this ferment induces cleavage of the amino groups very slowly. A preliminary heating of egg white to from 120 to 140° C. increases the proteolytic action of the trypsin. Similar results were obtained when fibrin, casein, and beef were heated, and contrary results with gelatin. An increase in amino cleavage products was noted after 15 hours' tryptic digestion.

The comparative chemistry of muscle—the partition of nonprotein water-soluble nitrogen, D. W. WILSON (*Jour. Biol. Chem., 17 (1914), No. 3, pp. 385–400*).—The author reports the results of studies of the distribution of nitrogen in the muscles of invertebrates, namely, lamprey, limulus, squid, clam, scallop, and periwinkle.

"The lamprey muscle contained a minimum of total extractive nitrogen, most of which was nonamino nitrogen. The values for the total amino nitrogen rose from a minimum in the lamprey which was only 4 per cent of the total extractive nitrogen, to a maximum in the clam and scallop which was over 50 per cent of the total extractive nitrogen. . . .

"The nonamino nitrogen is high in all the extracts examined. The major portion is in the diamino-acid fraction in which it greatly exceeds the amino nitrogen. Of the compounds isolated from these and similar extracts, betain, urea, prolin, arginin, histidin, and creatin contribute all or part of their nitrogen to the nonamino nitrogen fraction. The various qualitative and quantitative relations indicate that betain is probably an important constituent of extracts of muscles from these types of animals."

The total sulphur was also determined in the total extracts.

"The great qualitative and quantitative variations between the extracts of muscles from different vertebrates and invertebrates suggest fundamental differences in the tissue metabolism of these animals. . . . Comparative studies on the extractives of these simpler forms of life may throw some light on their rôle in the animal economy and aid in solving some of the problems of intermediary metabolism. Experiments like the above, besides furnishing interesting data, suggest points of attack where the variations are sufficiently large to furnish fruitful investigations."

The necessity relation of lipoids to life. The behavior of such essential substances to reagents which will extract lipoids, W. STEPP (*Ztschr. Biol., 62 (1913), No. 9–10, pp. 405–417*).—According to the author's conclusions, these important lipoid substances can not be extracted from a feeding stuff by ether but are readily extracted by alcohol.

Meeting the body food requirements during a 24-hour cycle, J. BERGONIÉ (*Compt. Rend. Acad. Sci. [Paris], 158 (1914), No. 15, pp. 1079–1082, figs. 3*).—From observations of the daily distribution of the energy requirement of the body and the fact that the period of maximum availability of the energy in the meals occurs about three hours after eating, the author recommends that the ordinary diet furnishing 1 part of fat, 1 part of protein, and from 4 to 5 parts of carbohydrate should be taken in 3 meals as follows: A heavy meal supplying from 1,400 to 1,500 calories at about 7.30 a. m.; a light meal supplying 300 to 400 calories at 4.30 p. m.; and a dinner supplying 700 to 800 calories at 8.00 p. m.

Rational utilization of human energy—scientific study of manual labor, J. AMAR (*Génie Civil, 64 (1914), No. 19, pp. 373–377, figs. 10*).—The author emphasizes the fact that to secure the greatest efficiency from the human motor its normal limit of fatigue must not be exceeded so that overfatigue results. Continuous action is contrary to the laws governing the human motor and rest periods of proper length must be provided to secure the maximum efficiency. In most systems for studying the efficiency of the human motor the physiological element is disregarded.

To determine the proper length and distribution of rest periods, as well as the most efficient way in which the human motor can be utilized, an experimental study was made of the energy expended in performing a number of different tasks.

The energy expended was measured by means of the oxygen consumption, this factor being determined by a respiration apparatus provided with a double

valve which permitted the subject to inhale and exhale by the mouth, the nose being closed. The work done in performing each task and the corresponding expenditure of energy by the body were measured by an especially designed ergograph. The curves obtained in this way were calibrated in kilograms and showed the various components of the forces applied by the body. At the same time the heart beat, pulse rate, and blood pressure were determined. Respiratory curves were obtained under conditions of normal fatigue and overfatigue, which, together with the arterial pressure, made it possible to follow the course of the functions essential to life during the performance of the task and to avoid excessive efforts on the part of the worker which might injure the organism.

In applying the results of these experiments to practical work in filing metal, the effect upon the respiratory exchange of varying the pressure, the contraction, the rhythm and length of the movements of the file, the position of the worker, and the intervals of rest were studied. The work of an experienced workman was also compared with that of an apprentice. Employing this same means, the laws which determine the most economical expenditure of energy in the performance of several tasks were also studied.

The fundamental factors studied in the case of the various tasks investigated were the amount of the contraction of muscle, the time during which it was sustained, the speed of the body movements, and the relation of the work periods to rest periods. The following conclusions are drawn from these studies:

The expenditure of energy is proportional to the length of the effort and degree of muscular contraction.

The expenditure of energy to produce a given task diminishes in proportion to the speed of contractions. This is true only within certain limits which produce serious physiological disturbances, such as alteration of muscular and nervous tissues when exceeded.

There is an optimum speed at which the maximum work may be obtained with the least fatigue, and this should be the true object of scientific management of industrial labor.

The rapidity of recovery of the muscle during rest is proportional to the rate at which it works. The oxygen consumption which indicates this rate may thus indicate the need of rest periods.

The price of labor expressed in terms of food fuel (*Jour. Amer. Med. Assoc., 62 (1914), No. 24, pp. 1895–1897*).—This article deals briefly with the question of the relation of the kind of work performed to the daily requirement of energy in the food.

ANIMAL PRODUCTION.

Digestion experiments with Texas feeding stuffs, G. S. Fraps (*Texas Sta. Bul. 166 (1914), pp. 5–26*).—This bulletin reports the results of digestion trials made with six sheep on various feeding stuffs. The experiments with the concentrates were carried out in several periods of 12 days each. In the first and last periods, alfalfa hay was fed, and in the other periods the concentrates to be tested were added, using 300 gm. of hay to 300 gm. of concentrates per day. The ration to be tested was fed 12 days, and the excrement collected during the last 6 days.

The average coefficients of digestibility of feeding stuffs, as reported by various experiment stations and including those found in these trials, together with the productive values of these feeds (pounds of fat produced by 100 lbs. of the feed, when fed in addition to a maintenance ration) are given in the table following.

Average coefficients of digestibility of feeding stuffs and productive values.

Feeding stuff.	Protein.	Ether extract.	Crude fiber.	Nitrogen-free extract.	Ash.	Productive value.
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Lbs.*
Alfalfa hay, average	75.29	38.40	46.17	68.83	49.87	8.18
Bermuda hay, average	53.10	41.60	53.17	50.63	33.73	7.32
Corn bran, average	58.20	76.63	59.56	77.21	8.48	13.33
Cold-pressed cotton seed, average	74.28	85.98	39.55	63.23	54.22	12.02
Cotton-seed meal, rich in hulls	72.90	90.60	37.30	61.80	.....	.....
Cotton-seed meal and hulls	77.69	97.29	51.04	67.91	26.22	14.49
Cotton-seed hulls, average	14.10	68.40	49.00	47.70	25.20	4.08
Cotton-seed meal, average	85.93	94.84	15.22	71.88	18.69	18.31
Kafir corn chop, average	56.20	47.20	27.40	68.80	43.40	14.63
Prairie hay, cut before frost	8.60	39.10	53.50	46.90	4.90	6.10
Prairie hay, cut after frost	9.00	57.30	66.70	57.10	28.00	8.11
Rice bran, average	64.35	80.85	19.05	81.92	15.98	17.15
Rice polish, average	67.30	82.10	25.70	91.10	30.00	20.67
Sorghum silage, average	9.00	56.00	58.00	64.00	.....	2.69
Silage (sorghum and cowpea)	23.77	57.93	49.24	63.67	19.82	3.55
Sorghum fodder, average	35.50	62.20	60.60	61.50	.....	9.19
Sorghum hay	13.50	54.00	55.60	55.90	23.40	7.59
Tabosa grass hay No. 1	17.00	27.10	52.50	41.80	18.40	4.77
Tabosa grass hay No. 2	22.90	46.70	56.50	53.10	21.40	6.57

The average composition and digestible nutrients of these feeds are also given.

Composition of feeds and a method of calculating rations, N. Athanassof (*Noções Sobre a Composição das Forragens e o Modo de Calcular as Rações. Sao Paulo, Brazil, 1912. pp. 56, figs. 18*).—This includes tables of composition and digestibility of grasses indigenous to São Paulo and of the more common feeding stuffs, together with a discussion of methods of calculating rations adapted from Kellner, Henry, et al.

Analyses of forage crops (*Bol. Agr. [Sao Paulo], 15. ser., No. 3 (1914), pp. 207–213*).—The composition and digestibility of the following forage crops are reported: *Panicum spectabile, P. altissimum, P. maximum, P. oryzoides, P. echinolæna, P. melinis, P. numidianum, Paspalum griseum, P. virgatum, P. stoloniferum, P. intermedium, P. pusilum, Polygonum sachalinense, Phaseolus compressus, P.* sp., *Andropogon rufus, A.* sp., *A. condensatus, Arracacia esculenta, Bromus unioloides, Cynodon dactylon, Crotalaria vitellina, Cajanus indicus, Desmodium leiocarpum, Galega officinalis, Gossypium barbadense, Ipomœa batatas, Mucuna utilis, Medicago falcata, Sechium edule, Spergula arvensis, Sporobolus argutus, Tricholæna rosea, Trifolium incarnatum, Triticum sativum, Zea mays, Z. caragua*, and *Oryza sativa*.

Composition and nutritive value of some feed plants, S. Ulmansky (*Mitt. Landw. Lehrkanz. K. K. Hochsch. Bodenkul. Wien, 2 (1914), No. 3, pp. 467–486*).—Analyses and data as to nutritive value are given of *Meum mutellina, Plantago alpina, Poa alpina*, and *Festuca rubra*, var. *fallax*, pasture and hay plants indigenous to the Alps

Commercial feeding stuffs, 1913.—Feed law, B. Youngblood (*Texas Sta. Bul. 164 (1914), pp. 5–67*).—This reports analyses of the following commercial feeding stuffs: Alfalfa meal, barley chop, corn chop, corn bran, corn feed meal, corn germ meal, corn and cob meal, cold-pressed cotton-seed cake, cold-pressed cotton-seed meal, cotton-seed cake, cotton-seed meal, dried brewers' grains, ear-corn chop, ground oats, hog flour, hominy feed, Kafir corn, Kafir head chop, Kafir meal, maize chop, maize-head chop, maize meal, mill-run bran, rice bran, rice polish, wheat bran, wheat chop, and wheat shorts. There is included general information on the feed-control service and compliance with provisions of the feedstuffs law.

Feeding stuffs (*Ber. Agr. Chem. Kontroll u. Vers. Stat. Pflanzenkrank. Prov. Sachsen, 1913, pp. 23–40*).—Analyses are reported of peanut meal, coconut cake and meal, linseed cake and meal, palm kernel cake and meal, rape-seed meal, sesame-cake meal, sesame seed, soy-bean chop, sunflower-seed meal, molasses feed, crude molasses, fresh and dried beet tops, turf molasses feed, sugar beets, potatoes, potato silage, blood meal, fish meal, calcium feed, and potato flakes, together with corn, wheat, oats, rice, barley, rye, and their various products.

Cotton-seed products and their competitors in northern Europe, E. W. THOMPSON (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Spec. Agents Ser., No. 84 (1914), pp. 93*).—This bulletin reports an investigation made of the commercial feeding stuffs of Germany, the United Kingdom, the Netherlands, Denmark, Sweden, and Norway, with special reference to their competition with American products. Methods of feeding in vogue in these countries and the importance of the various cakes and meals used are discussed. The theoretical valuation of feeding stuffs as determined by the Kellner, Hansson, and other methods is treated. There are included lists of feeding stuffs dealers in the several countries.

Fish feed meal, M. KLING (*Deut. Landw. Presse, 41 (1914), No. 37, pp. 457, 458*).—In commenting on the variability of composition of the different brands of fish meal the author recommends a uniform grade, having a guarantied analysis of 50 per cent protein, 5 per cent fat, 5 per cent salt, and from 20 to 25 per cent calcium phosphate.

Bengal beans, a new fodder, H. S. SHREWSBURY (*Bul. Dept. Agr. Trinidad and Tobago, 13 (1914), No. 81, pp. 194, 195*).—Experiments with Bengal beans, presumably *Macuna utilis*, indicate that very little, if any, hydrocyanic acid or other toxic materials are present. The taste and odor of the whole meal from the beans are pleasant and closely resemble those of pea meal. It is shown that these beans are somewhat superior in feeding value to French, Lima, or Java beans and that like these beans their nutritive properties are principally due to the high content of carbohydrates and proteins. Owing chiefly to their low percentages of fat, their value is considerably less than that of soy beans. Caution is recommended in the use of these beans as fodder.

The phosphoric substance of prairie grass, C. DUSSERRE (*Bul. Soc. Vaud. Sci. Nat., 5. ser., 49 (1913), No. 181, pp. XL–XLII*).—It is shown that the principal phosphorus compounds found in prairie grass which are of nutritive value to animals are the lecithins, the phytins, and the nucleins. Of these the phytins are in greatest amount, 54 to 62 per cent; the nucleins, 30 to 40 per cent; and the lecithins, about 10 per cent.

It was found that the application of superphosphate materially increased the phosphorus content of the plant and that this in turn increased the value for feeding purposes.

Mineral requirements of farm animals (*Wisconsin Sta. Bul. 240 (1914), pp. 32, 33*).—"A dry pregnant milch goat was fed rations low in lime during the entire gestation period, at the end of which she gave birth to twin 5-lb. kids, of normal weight and vigor. During this single period of gestation, the goat lost about 20 per cent of the total amount of lime contained in her body, including the amount stored in the bodies of the offspring, although without any outward or apparent ill effects." It is estimated that for fetus building and for milk production the 1,000-lb. pregnant cow will require from 1.8 to 2.1 oz. of lime per day. Such requirements are usually met by the ordinary farm roughages such as hay and corn stover, but with straw in any large quantity as a part of the ration the lime supply would be deficient.

Value of fat from various sources (*Wisconsin Sta. Bul. 240 (1914), pp. 33, 34*).—In studies by E. V. McCollum continuing previous work (E. S. R., 28,

p. 872), in which rats fed certain mixtures composed of pure casein, carbohydrates, and salt mixtures made normal growth for periods varying from 70 to 120 days, but after that time made little or no increase in the body weight. Fat from egg yolk or butter was added to the ration. Growth was immediately resumed. When olive oil was added, however, no such effect was produced. The results suggest a difference between the physiological values of fat from different sources.

Some mechanical factors in digestion, S. Sisson (*Amer. Vet. Rev., 45 (1914), Nos. 4, pp. 408–422; 5, pp. 513–526*).—This is a rather complete treatise on the mechanical factors involved in digestion by domestic animals, especially horses and cattle. The investigations made by Scheunert, Schattke, and others are cited.

Controlled natural selection and value marking, J. C. Mottram (*London, New York, Bombay, and Calcutta, 1914, pp. IX+130, figs. 8*).—The author of this book presents a new theory with regard to the course taken by natural selection. He contends that since natural selection must appreciate differences in structure and since it must treat associations as units and bring about diversity of structure in them these structures control natural selection, so that the less valuable individuals are more liable to be destroyed than the more valuable. It is thought that the application of this theory or hypothesis may explain the origin and use of some polymorphisms.

Coat color in pointer dogs, C. C. Little (*Jour. Heredity, 5 (1914), No. 6, pp. 244–248*).—From a study made of the studbook of the American Kennel Club with reference to coat color in pointer dogs it is concluded that there is a recessive type of yellow dog, analogous to the recessive yellow of guinea pigs, and that the relation of brown to black is the same in dogs as in other small mammals in which the matter has been experimentally investigated.

Nondisjunction of the sex chromosomes of Drosophila, C. B. Bridges (*Jour. Expt. Zool., 15 (1913), No. 4, pp. 587–606; abs. in Science, n. ser., 40 (1914), No. 1020, pp. 107–109*).—The author of this article presents evidence tending to prove that the parallelism between the behavior of the chromosomes and the behavior of sex-linked genes and sex in the case of Drosophila means that the sex-linked genes are located in and borne by the X-chromosomes.

Animal industry in the Kongo, E. Leplae (*Min. Colon. Belg., Rap. Agr. Congo Belge, 1911–12, pp. 210–244, figs. 29*).—This report relates to the types of cattle, horses, mules, sheep, and swine indigenous to the Kongo, their improvement and utility value, and to the importation of foreign breeds into that section.

Economic factors in cattle feeding.—IV, Cattle feeding conditions in the corn belt, H. W. Mumford and L. D. Hall (*Illinois Sta. Circ. 175 (1914), pp. 5–19, figs. 2*).—In this discussion of prevailing conditions, it is stated that about one-third of the cattle of the country other than milch cows are contained in the seven States embracing what is known as the corn belt, and that their value is equal to about two-fifths of the total value of such cattle in the United States. It is shown that the number of beef cattle bred in this section is rapidly diminishing, the supply of feeders coming largely from the West or elsewhere. At the same time there has been an enormous increase in the number of dairy cattle, the indiscriminate breeding of which to beef stock has deteriorated the quality of beef cattle. Four-fifths to nine-tenths of the beef cattle marketed from typical corn-belt localities are cattle that have been purchased as stockers or feeders, while the fattening of cattle has passed largely from the hands of general farmers to those of professional cattle feeders.

Causes attributed for these conditions are the relatively high prices of grain compared with those for fat cattle, increase in land values, extension of cattle-

feeding operations in the West, increase in farm tenancy, and neglect of soil fertility. It is thought that due to the increasing demand for grain-fattened beef cattle an increasing proportion of the cattle matured in the corn belt must be reared there, rather than in the West. Improved and intensified farming methods, the introduction of corn silage, alfalfa, and other forage crops, the more complete utilization of waste roughage, and increased attention to manure as a means of maintaining fertility will tend to render cattle production more practicable. However, there must be an increase in prices paid for cattle corresponding to the increased cost of production.

Feeding baby beef, W. P. SNYDER (*Nebraska Sta. Bul. 143 (1914), pp. 5–39, figs. 5*).—In a preliminary feeding experiment 30 450-lb. beef calves were fed for 7½ months on alfalfa and prairie hays, corn, and oats, during which time they ate 46.1 bu. of corn, 3.63 bu. of oats, and 1.32 tons of forage per head. The average total gain per head was 482.7 lbs., or an average daily gain of 2.11 lbs., while the cost per pound of gain was 6.89 cts. A net profit of $2.70 was realized, or when profits on hogs were taken into consideration an estimated net profit per calf of $7.96.

The experiment proper included two years' work, the first year of 223 days, the second of 233 days. In these duplicate tests five lots of from 13 to 15 head of 440-lb. grade beef calves were fed as follows: Lot 1, prairie hay, and corn and cotton-seed cake 9:1; lot 2, alfalfa hay and prairie hay 72:28, and corn; lot 3, alfalfa and silage 1:1, and corn; lot 4, prairie hay and silage 47:53, and corn; and lot 5, prairie hay and silage 9:11, with corn and cotton-seed cake 9:1. The grain ration was increased as the feeding period progressed.

The average daily gain per calf was for the two yearly tests 1.8, 1.96, 2.07, 1.63, and 1.8 lbs., the grain required per pound of gain 5.76, 5.05, 4.91, 5.96, and 5.66 lbs., and the forage 5.55, 5.51, 7.79, 8.81, and 7.97 lbs. The cost of feed per pound of gain was 7.74, 6.97, 7.03, 8.24, and 7.86 cts., while the net profit realized per head was $9.43, $13.66, $15.02, $4.99, and $7.40, or including the profit from pork $17.05, $20.28, $22.21, $11.77, and $13.82 for the respective lots.

From these results it is seen that a ration of alfalfa hay, corn silage, and corn gave the largest gain, the cheapest gain, and the most profit of any ration used. Rations containing alfalfa hay and those containing cotton-seed cake gave larger and cheaper gains than those not containing these protein materials. The ration composed of prairie hay, cotton-seed cake, and corn gave the same average rate of gain and about the same cost of gain as the ration composed of prairie hay, cotton-seed cake, corn, and silage, indicating that silage as fed in these tests was not worth the value usually given it. When silage was fed with alfalfa the silage was worth much more than when it was fed with prairie hay and cotton-seed cake. Cotton-seed cake was not a profitable substitute for alfalfa.

Skin temperature and fattening capacity in oxen, T. B. WOOD and A. V. HILL (*Jour. Agr. Sci. [England], 6 (1914), No. 2, pp. 252–254*).—Measurements were made of the skin temperature of 18 oxen which had been for some time on a fattening ration. Measurements were taken by means of a thermopile, the tin plate being placed over the ribs behind the shoulder blade where the skin temperature was comparatively constant.

Animals classed as good "doers," which had increased in live weight more than 2 lbs. per head per day during the last three weeks, had a lower skin temperature, amounting to about 3° C., than the "poor doers," which had increased less than 1 lb. per head per day. It was noticeable that every animal in the class of "bad doers" had a higher skin temperature than the average of the 8 "good doers." These results are considered only preliminary, but are indicative of what may be expected.

The Simmental breed of cattle, C. S. PLUMB (*Breeder's Gaz., 66 (1914), No. 7, pp. 228, 229, figs. 3*).—An account of the characteristics, distribution, and utility value of this breed of cattle. These cattle are essentially dual purpose, being adapted for both beef and dairy purposes. The breed is a prime favorite in Switzerland, and has been exported in large numbers to portions of Germany and Hungary.

Proportions of shelled corn and alfalfa hay for fattening western lambs, W. C. COFFEY (*Illinois Sta. Bul. 167 (1914), pp. 53–82, fig. 1*).—In experiments to determine the proportions in which shelled corn and alfalfa hay should be fed to western lambs four lots of 20 69-lb. wether lambs were fed during a 90-day period corn and alfalfa hay in the following average proportions: Lot one 1 : 0.99, lot two 1 : 1.36, lot three 1 : 2.42, and lot four 1 : 3.45. The proportion of corn to hay was increased as the feeding period progressed, only a small allowance of grain being given at the start. The average digestible nutrients received per lamb per day were 0.235, 0.241, 0.247, and 0.251 lbs. of protein, and 1.441, 1.37, 1.233, and 1.169 lbs. of carbohydrates and fat for the respective lots. The gain per lamb per day was 0.3, 0.269, 0.216, and 0.203 lbs., and the total feed required per pound of gain 8.2, 9.16, 11.18, and 11.84 lbs., respectively.

In a second experiment three lots of 20 65-lb. wether lambs were fed during a 98-day period corn and alfalfa in the following average proportions: Lot one 1 : 2.03, lot two 1 : 1.31, and lot three 1 : 0.86. The average digestible nutrients received per lamb per day were 0.258, 0.281, and 0.29 lbs. of protein, and 1.651, 1,641, and 1.46 lbs. of carbohydrates and fats for the respective lots. The gains per lamb per day were 0.331, 0.32, and 0.294 lbs., and the total feed required per pound of gain 7.64, 8.22, and 9.05 lbs., respectively.

The greatest proportion of corn that it was possible to get the lambs to consume at any stage of the feeding period was one part corn to 0.66 part hay. The lambs fed the greatest proportion of corn, which was also the greatest amount, were rather difficult to keep on feed.

In experiment number one the lots consuming the largest amount of grain (the smallest amount of protein), consumed the largest amount of water. In each experiment the lambs receiving the largest proportion of corn made the largest gain; with the exception of one lot the 10 heaviest lambs in each lot made greater gains than the 10 lightest lambs. It appears that the power of lambs to consume feed increases gradually with the advance of the feeding period.

With various combinations of prices for corn and hay, excepting a combination of very dear corn and very cheap hay, it was demonstrated that the lots fed the greater proportions of corn than hay produced the cheapest gains and returned the most profit. It was also demonstrated that in order to make the feeding operation profitable with feeds of high cost a margin of $1 per hundredweight based on home costs and weights is necessary, but that with feeds of comparatively low cost this margin is not necessary.

In experiments with ewe lambs corresponding to experiment number one with wether lambs it was demonstrated that there was very little difference in their feeding and market qualities.

Comparing early and late shorn lambs it was demonstrated that the shorn lambs ate more feed than unshorn lambs in warm weather, but there was little difference between them in gains and no difference in market quality. Lambs left in the fleece until the end of the experiment sheared from 2 to 2.75 lbs. per head more than early shorn lambs and on this account returned more profit.

On the effects of complete and incomplete castration upon horn growth in Herdwick sheep, F. H. A. MARSHALL and J. HAMMOND (*Jour. Physiol., 48 (1914), No. 2–3, pp. 171–176, figs. 6*).—In continuing work previously noted

(E. S. R., 27, p. 70) it is concluded that "removal of the testes from Herdwick ram lambs arrests further horn growth forthwith and at any stage of development. Unilateral castration does not stop horn growth, neither does it affect the symmetry of the horns, but there is some evidence that the further development of the horns is slower than in normal unoperated animals. Removal of the testes without the epididymes (these being retained) inhibits horn growth in precisely the same way as ordinary castration in which both organs are removed."

The wool conference in Washington (*Bul. Nat. Assoc. Wool Manfrs., 44 (1914), No. 3, pp. 227–271*).—This reports the proceedings of the conference of wool manufacturers, wool merchants, and wool growers held in Washington, June 2, 3, and 4, 1914, for the purpose of considering the subject of improved methods of handling wool and raising sheep in the range and farm States. The subjects discussed included the manufacturing value of American wool, present methods of handling American wools on the farm and ranch, foreign methods of handling wool, methods of effecting improvement in the handling of American wool, control of predatory animals in range States, the dog problem in farm States, means of increasing the number of farm sheep, improvement in range breeding methods, and statistics on sheep and wool.

Substitutes for corn in rations for fattening swine, G. R. Eastwood (*Ohio Sta. Bul. 268 (1914), pp. 147–164, figs. 3*).—In experiments comparing the feeding value of corn and oats, two lots of five 265-lb. pigs each were fed during a 126-day feeding period, lot 1 receiving corn and tankage 9:1 and lot 2 oats and tankage 9:1. These lots made 1.52 and 1.9 lbs. average daily gain per pig, respectively, requiring 4.18 and 4.957 lbs. of feed per pound of gain and dressing 81 and 76 per cent, respectively. Four lots of five 150-lb. pigs were fed during an 84-day period, lot 1 receiving corn and tankage 9:1, lot 2 corn, oats, and tankage 6:3:1, lot 3 corn, oats, and tankage 3:6:1, and lot 4 oats and tankage 9:1, and made 1.75, 1.57, 1.49, and 0.99 lbs. average daily gains per head for the respective lots, requiring 4.3, 4.58, 4.73, and 5.71 lbs. of feed per pound of gain, and lots 1 and 4 dressing 80.3 and 76.1 per cent, respectively.

It is concluded that oats are less valuable per unit of weight than shelled corn, and that the larger the proportion of corn in the corn, oats, and tankage combination, the greater is the efficiency. The price of feeds will naturally influence the economy of the different feed combinations. Whenever prices will permit, oats may be used as a part of the ration during the early part of the fattening period, being gradually reduced until the last four or five weeks of feeding.

Comparing corn and hominy feed, four lots of four 90-lb. pigs fed during a 105-day period, lots 1 and 3 receiving corn and tankage 9:1, lots 2 and 4 hominy feed and tankage 9:1, and the rations being reversed at the end of 63 days, made 0.89, 1.52, 1.17, and 1.38 lbs. average daily gains per head for the respective lots during the first 63 days and consuming 4.53, 3.87, 4.1, and 3.85 lbs. of feed per pound of gain, and during the last 42 days 1.31, 1.92, 1.38, and 1.76 lbs. average daily gain per head, and consuming 3.86, 4.62, 3.95, and 4.79 lbs. of feed per pound of gain. Two lots of four 67-lb. and two lots of four 55-lb. pigs were fed during a 126-day period, lots 1 and 3 receiving ground corn and tankage 9:1, lots 2 and 4 hominy feed and tankage 9:1, and the ration being reversed at the end of 70 days. These made 1.09, 0.98, 0.75, and 0.85 lbs. average daily gains per head, respectively, for the first 70 days, consuming 4.11, 3.86, 4.52, and 4.02 lbs. of feed per pound of gain, while they made 1.64, 1.79, 1.31, and 1.41 lbs. average daily gain per head and consumed 4.05, 4.04, 4.03, and 4.27 lbs. feed per pound of gain during the last 56 days.

These results indicate that hominy feed has a feeding value for swine about 10 to 15 per cent greater than that of an equal weight of ground corn.

In experiments comparing corn, wheat, and middlings four lots of five 110-lb. pigs were fed during a 91-day period, lot 1 receiving ground corn and tankage 9:1, lot 2 ground wheat and tankage 9:1, lot 3 middlings and tankage 9:1, and lot 4 middlings alone, and made 1.57, 1.59, 1.52, and 1.44 lbs. average daily gain per head for the respective lots, requiring 3.66, 3.83, 3.72, and 3.65 lbs. of feed per pound of gain.

Comparing corn and rye, two lots of four and six 44-lb. pigs were fed during a 49-day period, lot 1 receiving corn and tankage 9:1 and lot 2 hogged-down rye and tankage, and made 0.46 and 0.51 lbs. average daily gain per head, requiring 448 and 372 lbs. of feed per 100 lbs. gain. These same pigs were put in a dry lot, lot 1 on corn and tankage as before, and lot 2 on rye and tankage, and fed during a 112-day period, making 1.09 and 1 lbs. average daily gain per head, and requiring 3.99 and 4.41 lbs. of feed per pound of gain.

In an experiment comparing light and heavy grain rations on rape pasture with a heavy grain ration in dry lot, five lots of 16-week-old pigs were fed during a 77-day period, lot 1 receiving corn and tankage 9:1, full feed in dry lot; lot 2 corn, full feed on rape pasture; lot 3 corn, ¾ full feed, on rape pasture; lot 4 corn and tankage 9:1, full feed, on rape pasture; and lot 5 corn and tankage 9:1, ¾ full feed, on rape pasture. The lots made 0.9, 1.21, 1.06, 1.47, and 1.2 lbs. average daily gain per pig for the respective lots, and consumed 3.847, 3.254, 2.781, 3.166, and 2.94 lbs. concentrates per pound of gain.

The results of this experiment, as well as those of experiments previously reported (E. S. R., 28, p. 468) indicate that "by feeding a light grain ration on pasture, gains may be produced at a much smaller expenditure for grain, though less rapidly, than by feeding a heavy grain ration on pasture, and also that the use of green feeds in connection with corn greatly diminishes the need for nitrogenous concentrates that exists in dry lot feeding."

Ground wheat versus whole wheat for fattening pigs, R. K. Bliss and C. B. Lee (*Nebraska Sta. Bul. 144 (1914), pp. 3–13, figs. 3*).—Four lots of 10 pigs each weighing approximately 138 lbs. made average daily gains per pig during an 84-day feeding period of 0.84, 1.09, 1.19, and 1.32 lbs., respectively, at a cost per pound of gain of 7.39, 6.67, 5.38, and 6.07 cts., respectively. Lot 3, fed soaked ground wheat, consumed 4.43 lbs. of wheat per pound of gain, while lot 1, fed soaked whole wheat, consumed 5.91 lbs. Grinding the wheat resulted in a net saving of 21 cts. per bushel. Lot 4, fed ground wheat and tankage, consumed 4.215 lbs. of grain and 2.07 lbs. of tankage per pound of gain, while lot 2, fed a similar mixture of whole wheat and tankage, consumed 4.858 lbs. of wheat and 2.39 lbs. of tankage, so that grinding the wheat resulted in a net saving of 7 cts. per bushel. The addition of 5 per cent of tankage proved much more efficient in reducing the amount of wheat required to produce a pound of gain when fed with whole wheat than it did when fed with ground wheat. Considerable whole wheat passed through the pigs of lot 1 and 2, and it was apparently better digested when fed with tankage. At the end of the eighth week of feeding the lots had made 42, 56.7, 56.5, and 67.5 lbs. total gain per pig, respectively; at the end of the tenth week, 57, 73, 76, and 90 lbs., and at the end of the twelfth week 70.5, 91.6, 100, and 110.8 lbs., respectively.

Five lots of nine pigs each weighing approximately 108 lbs., were fed during a 98-day period as follows: Lot 1 shelled corn dry; lot 2 whole wheat dry; lot 3 whole wheat soaked; lot 4 ground wheat moistened; and lot 5 ground wheat soaked. The test was duplicated and the results of the two tests averaged. The average daily gains per head for each lot were 1.11, 1.02, 1.05, 1.36, and 1.41 lbs., respectively, the cost per pound of gain being 5.48, 6.42, 6.35, 5.64,

and 5.46 cts., respectively, and the grain required per pound of gain 4.68, 5.11, 5.04, 4.26, and 4.13 lbs.

On ovariotomy in sows, with observations on the mammary glands and the internal genital organs, III, K. J. J. MACKENZIE, F. H. A. MARSHALL, and J. HAMMOND (*Jour. Agr. Sci. [England], 6 (1914), No. 2, pp. 182–186*).—This continues work previously noted (E. S. R., 30, p. 673).

From examinations made of 297 pigs, including hogs, spayed sows, and sows in different stages of pregnancy "it was evident that the occurrence of pro-œstrum or œstrus was in no way correlated with the presence or absence of pigment in the mammary area. Neither could it be said that pigment was present in greater quantity during the heat period." Pigment was present in many of the spayed sows, although there are some indications that the amount present was liable to be less in the operated pigs. The pigment does not occur in white pigs. It is commonest in the black sows, but occasionally is found also in black hogs. There was considerable variation in the quantity and distribution of the mammary pigment in the colored breeds.

A case of incomplete ovariotomy was discovered in which one ovary has been retained and distinct signs of œstrus were shown by the animal, thus proving that "heat only occurs in sows when functional ovarian tissue is present, and that removal of the uterus without the complete removal of both ovaries is totally ineffective in preventing the recurrence of the œstrous cycle."

The Sapphire hog, J. A. MCLEAN (*Jour. Heredity, 5 (1914), No. 7, pp. 301–304, fig. 1*).—This reports the formation of a so-called new breed of swine having as its principal characteristics blue color with variations, erect ears, trim bellies, strength of bone, and fat hog conformation with length of body. This breed is being evolved from the Yorkshire, Hampshire, Berkshire, Essex, and Chester White breeds. A large percentage of the pigs are breeding true.

Feeding draft foals (*Wisconsin Sta. Bul. 240 (1914), pp. 31, 32, figs. 1*).—Eleven pure-bred draft foals were fed by J. G. Fuller an average of 16.5 lbs. each of a mixture of ground oats, corn meal, bran, and cut alfalfa hay 6:1.5:1:1.5, on which they averaged gains of 2.1 lbs. per day at an average daily feed cost of 18 cts. They weighed at the end of the year from 1,000 to 1,200 lbs., the average cost of feed being $51.66.

Cost of keeping work horses, W. E. FOARD (*Breeder's Gaz., 66 (1914), No. 7, p. 236, fig. 1*).—Data secured from the records of 10 Missouri farms having from 4 to 10 horses each show the average total annual cost of keeping a horse to be $81.91, of which feed cost amounts to $62.29, labor $9.84, and miscellaneous $9.78. The total hours worked was 1,002, making the average cost 8.2 cts. per hour. There was a large variation in the cost among the several horses, also in the labor performed. As a rule the horse that worked more cost more to keep.

The inheritance of coat colors in horses, W. S. ANDERSON (*Kentucky Sta. Bul. 180 (1914), pp. 121–145, figs. 6*).—In this study the colors of 42,165 horses, representing 14,055 matings, were used.

In explanation of his findings the author concludes that from all the evidence chestnut is recessive to all colors; black dominant to chestnut and recessive to all others; bay dominant to chestnut, and black, and recessive to the three coordinate colors, gray, roan, and dun. The colors can be arranged in three series as follows: Gray, bay, black, and chestnut; roan, bay, black, and chestnut; and dun, bay, black, and chestnut; the first color of each series being dominant to all members of the series. Chestnut comes last and is recessive to all before. It is stated that there is no question that bay is recessive to gray, roan, and dun, and dominant to chestnut and black.

The author discredits the theory that strength or endurance goes with the colors. The factors, or determiners, which control the transmission of color are independent of all other qualities. The colors are unit characters and they behave as simple Mendelian colors.

It is stated that a fundamental characteristic of the chemical precursors of the melanins, the chemical compounds causing the coloring of the hair-coat, is their power to take up under different conditions different amounts of oxygen; small amounts of oxygen producing the lighter shades of pigmentation, while larger amounts cause the darker shades until the black is reached. The factor which determines the extent of oxygen resides in the germ cell.

The possibility of so breeding horses as to secure strains of chestnut, bay, black, and gray is discussed.

The origin of domestic fowl, C. B. DAVENPORT (*Jour. Heredity, 5 (1914), No. 7, pp. 313–315, figs. 4*).—In this paper the author attributes the origin of the domestic fowl to two distinct species, one the Jungle fowl, which is still found wild, and the other the unknown ancestor of the Aseel or Malay fowl. These two species are described and their introduction in the evolution of the domestic breeds of fowl explained.

Egg-laying competitions, 1913–14, D. F. LAURIE (*Dept. Agr. So. Aust., Egg-Laying Competitions 1913–14, pp. 32*).—In connection with these egg-laying competitions it was noted that of 125 pens of White Leghorns observed, eggs with tinted shell were collected from 71. It is believed that this is a character common to all birds, but subject to the phenomenon of dilution or marking. The largest number of pens showed tinted eggs during the months of June, July, August, and September.

With regard to the relationship between the characters which stand for "broodiness" and those for "color of shell," it was noted that of the 125 pens of White Leghorns, 51 pens were recorded for both "tinted eggs" and "broody birds," while 74 pens were recorded as showing only one character.

DAIRY FARMING—DAIRYING.

Comparison of one- and two-day test (*Guernsey Breeders' Jour., n. ser., 4 (1913), No. 3, pp. 13, 14*).—Results obtained by the American Guernsey Cattle Club in a study of the advanced registry work the basis of a monthly one-day or two-day test are summarized as follows:

Of 41 cows selected at random from 38 herds, 16 gave during the year an average of 3.23 lbs. more milk fat on the one-day test (using first day) than on the two-day test, while the remaining 25 cows, gave an average of 5.1 lbs. less on the one-day than on the two-day test. Seven cows varied less than 1 lb. of milk fat in a year, five less than two, seven less than three, four less than four, five less than five, eleven less than between five and ten, and two less than 10 lbs. The least amount of variation in the 41 cows was 0.12 lbs., and the two largest were 13.63 and 16.35 lbs. milk fat.

The records of 250 cows were then worked out, and of these, 114 cows gave 527.02 lbs. more milk fat on a one- than a two-day test, while 136 cows gave 581.01 lbs. less.

Comparison of one- and two-day tests.—The trustworthiness of estimates of the richness in butter fat of a cow's production for a year, made by the method of the Guernsey Cattle Club from one one-day test per month, E. L. THORNDIKE (*Guernsey Breeders' Jour., n. ser., 4 (1913), No. 3, pp. 29–32*).—From a study of the above records and the probable "error of the neglect of the relation of the daily percentages of butter fat to the daily amounts

of milk," and of assuming 30 daily percentages of butter from only two, it is concluded that "the trustworthiness of the advanced register records is very slightly impaired by the use of only a two-successive-days' test to sample the entire 30 of a month. It may be assumed with practical certainty that such sampling will never cause an error of over 23 lbs. in the total result for a year, that in 99 cows out of a 100 the error will be under 15 lbs., and that the average error will be 4½ lbs. under. The divergence of a cow's record, 12 one-day tests being used, from her true record, will be under 6½ lbs. on the average, under 21 lbs. in 99 cows out of a 100, and under 32 lbs. always."

From a study made of the records of 50 of the cows with respect to the possible divergence during a term of years, "it appears that a year's record as now taken by 12 two-day tests would never diverge from the average of 15 years' records similarly taken for that cow (were such obtainable) by more than 35 lbs., would diverge therefrom by more than 22 lbs. or more only once in a hundred times, and would diverge therefrom on the average by a little under 7 lbs." This 35 lbs. may then be taken as the upper limit of possible error since it also includes the divergence that might occur during the single year. "It seems safe to credit at least 7 of the 35 lbs. to these sources of variation which are added to those which make a record as now determined vary from the cow's true record for the year. If this is done we have then an upper limit of error for the record from 12 two-day tests of 28 lbs. butter fat by this method. . . . To say that in 99 cases out of 100 it will be true within 18 lbs., and that on the average it will be true within 5½ lbs., is to make a thoroughly guarded statement."

Comparative value of one- and two-day tests as viewed by the experiment station (*Guernsey Breeders' Jour., n. ser., 4 (1913), No. 3, pp. 16, 17*).—In connection with the endeavor of the Jersey and Guernsey Associations to get a uniform basis of advanced register testing, inquiries were sent to 24 experiment stations asking the comparative cost and relative accuracy of one- and two-day tests. The answers indicated that the difference in cost is slight and the accuracy of the two-day test greater.

The nature and causes of the variations in the richness in butter fat of milk from the same cow, E. L. THORNDIKE (*Guernsey Breeders' Jour., n. ser., 4 (1913), No. 5, pp. 35–39, figs. 6*).—In connection with the milk fat tests made by the American Guernsey Cattle Club, reported above, a study was made of the causes of the variations in richness of the milk fat. It was found that a cow has a general average richness of milk which distinguishes her from other cows. If this general average of richness is taken as 100, the climatic, feeding, and other conditions related to season of the year, make her tend in any month to vary from this general average richness as follows: January 104.9, February 103.1, March 100, April 99.4, May 98.6, June 95.5, July 95.7, August 97.4, September 98.8, October 101.2, November 101.3, and December 104.5. These figures relate to the northern states from which tests were taken. The stage in the lactation period makes her tend to vary from this general average richness as follows: First month of lactation 89.6, second month 90.3, third 92.4, fourth 96.5, fifth 97.9, sixth 101.2, seventh 103.2, eighth 103, ninth 104.3, tenth 104.9, eleventh 105.3, and twelfth 109.4. However, this general tendency which the cow has as a member of the breed and species seems to be much complicated by individual peculiarities.

Of the cow and her treatment, "some cows seem to give almost as rich milk at the start as at the end; some to change gradually all along the year; some to change very rapidly in the early months and then hardly any; some to change hardly any till the later months and then very rapidly. There are in addition to these long swings and changes, irregular temporary ups and downs due to

minor causes. These fluctuations range up toward a fifth of the cow's general average richness, so that it is possible for a cow testing 5 per cent butterfat in general to go down to 4 per cent and up to 6 per cent independently of time of year, lactation period, and her own general course of change in richness. Such extreme fluctuations are however very rare, half of these irregular ups and downs being between —0.2 per cent butter fat and +0.2 per cent butter fat, four-fifths of them being between —0.4 per cent and +0.4 per cent, and nearly 96 per cent of them between —0.6 per cent and +0.6 per cent. The fluctuations up do not differ notably from the fluctuations down, but almost balance them in every way. The nature of these temporary fluctuations in the butter fat percentage is such as to make it probable that they are due to the combined action of many causes, each of which by itself alone would raise or lower the richness only slightly. When it happens that a large number of the 'reducing' causes act at once and few of the 'increasing' causes, there is a large fluctuation downward. Conversely, for the large fluctuations upward. Since such happenings are necessarily rare, the large fluctuations are rare."

The yield and composition of the milk of the Montgomery herd at Pusa and errors in milk tests, J. W. LEATHER and A. C. DOBBS (*Mem. Dept. Agr. India, Chem. Ser., 3 (1914), No. 6, pp. 147–175*).—In these tests, certain of the cows appeared to yield more milk from one side of the udder than from the other, although in general similar in both quantity and quality. There was a difference found in both quantity and quality of the milk from the fore and hindquarters which appears to be characteristic of the individual cow. One cow yielded milk from the forequarter which was consistently richer than that from the hindquarter, while another yielded richer milk from the hind than from the forequarter, and a third showed no characteristic difference. It is thought that the quality of the milk is a function of the tissue of that region of the cow's udder in which it is produced and that though the opposite sides are symmetrical in this respect, the udder is in other directions no more uniform in function than it is in shape.

Fat content of milk and rate of coagulation with rennet, A. KREIDL and E. LENK (*Biochem. Ztschr., 63 (1914), No. 2–3, pp. 151–155, figs. 3*).—The authors found that the time required for the coagulation of a milk with rennet is not constant even under similar experimental conditions. The rate of coagulation varies with the fat content, and is smaller the richer the milk is in fat.

Testing for fat in milk by the Babcock test (*Illinois Sta. Circ. 174 (1914), pp. 11, figs. 13*).—Instructions are given for the use of the Babcock test.

Bacteriological examination of market milk, P. G. HEINEMANN (*Trans. 15. Internat. Cong. Hyg. and Demogr. Washington, 2 (1912), Sect. 1–2, pp. 133–135*).—This gives the text of the article previously noted (E. S. R., 28, p. 275).

Studies in bacterial metabolism, A. I. KENDALL, A. A. DAY, and A. W. WALKER (*Jour. Amer. Chem. Soc., 36 (1914), No. 9, pp. 1937–1966*).—This consists of a series of eight papers treating of the metabolism of various types of bacteria in milk. The observations recorded were made for the purpose of determining the nature and extent of the changes brought about by the growth of various important types of bacteria in sterile certified milk. "These determinations include the changes in reaction, as shown by alizarin, neutral red, and phenolphthalein, which indicate somewhat roughly the differential accumulation of alkaline or acid products, and the action on protein as represented by the accumulation of ammonia, ammonia being the only available index of protein breakdown applicable to this problem."

Among the bacteria studied are those of the typhoid-dysentery-alcaligenes group, intermediate or paratyphoid group, coli-proteus-cloacæ group, subtilis-mesentericus group, *Bacillus pyocyaneus, B. diphtheriæ, B. suipestifer, Vibrio*

choleræ, *B. tuberculosis*, and coccal groups. Observations were also made on fat splitting in milk by bacterial lipase.

Preparation of buttermilk which can be preserved for a long time, R. SUWELACK (*German Patent 273,628, Jan. 30, 1913; abs. in Jour. Soc. Chem. Indus., 33 (1914), No. 14, p. 763*).—"Fresh buttermilk is heated for some time at not below 85° C., with vigorous agitation, then rendered homogeneous by forcing it, under a pressure of about 250 atmospheres, through narrow tubes against a hard surface, and after being cooled and freed from air is inclosed in air-tight vessels."

An investigation into the composition of cheese made from whole milk, G. BROWNLEE (*Dept. Agr. and Tech. Instr. Ireland Jour., 14 (1914), No. 3, pp. 499–506*).—From tests for fat made of a large number of samples of green and cured cheese it was found that on a dry matter basis "in the Cheddar cheeses the highest and lowest percentages were 53.54 and 48.72, respectively, in the green, and 52.96 and 48.6 in the cured, while for the Caerphilly cheeses the corresponding figures are 56.79 and 47.75 for the green, and 57.15 and 47.11 for the cured. The average percentage of fat in the dry matter of all the green cheese samples is 51.49 and of the cured 51.19, while that for all (327) samples is 51.33. . . . Taking the figures here found as a basis, one might safely recommend that a percentage of 45 should be taken as the limit below which the fat in the dry matter of a genuine cheese should not fall."

It is calculated that "1 gal. of milk gives 1.3 lbs. green Caerphilly cheese, 1.239 lbs. cured Caerphilly cheese, 1.056 lbs. green Cheddar cheese, and 1 lb. cured Cheddar cheese."

Pasteurized milk cheese (*Wisconsin Sta. Bul. 240 (1914), pp. 39, 40*).—Continuing work previously noted (E. S. R., 28, p. 581), tests conducted at various commercial factories in making pasteurized Cheddar cheese were satisfactory, an increase in yield of from 3 to 5 per cent being obtained. In some cases the texture was slightly inferior because of small holes. The extra cost of making pasteurized cheese was about $2.25 per 1,000 lbs. Likewise satisfactory results have been obtained in making pasteurized brick cheese.

Three creamery methods for making buttermilk cheese, J. L. SAMMIS (*Wisconsin Sta. Bul. 239 (1914), pp. 3–24, figs. 7*).—Complete information is given on three methods of making buttermilk cheese, one of these previously referred to (E. S. R., 23, p. 181; 25, p. 583), which has been used for several years at creameries and in dairies in making cheese from ordinary buttermilk. The other two deal with the use of buttermilk obtained from cream pasteurized while sour.

Ice cream investigations (*Wisconsin Sta. Bul. 240 (1914), pp. 40, 41, fig. 1*).—In studying the factors which govern the overrun or "swell," the body texture, and the flavor of ice cream, A. C. Baer found that "the longer a cream is held cold the more viscous or the thicker it becomes, and the greater is the tendency to produce a high overrun during the freezing process. If the mixture is frozen too quickly, especially at the critical temperature between 30–28° F., not enough time is given to whip up the mixture properly and a low overrun will result. For this reason the temperature of the freezing mixture should not be too low.

"For proper whipping of the mixture to produce a good swell, a speed of at least 100 to 150 revolutions per minute is necessary in a freezer of the ordinary batch type, and from 200 to 250 revolutions in a continuous machine. Too rapid freezing produces a soggy and course grained ice cream. On the other hand, freezing too slowly may allow too much whipping and thus produce an undesirable open and foamy texture. Aging cream makes it more viscous, thus producing a firmer and smoother ice cream. A raw cream produces a

little better body and a smoother texture than pasteurized cream, but proper aging of the pasteurized cream will overcome this defect. Homogenizing the cream tends to produce a firm and smooth cream. Ordinarily ice cream does not usually contain enough solids in the form of milk fat and other milk solids to retain a firm body and smooth texture unless some filler is used. Cheap, inferior flavoring materials or poor grades of fillers will always show their effect on the flavor of the ice cream. A badly tainted or slightly sour cream can not be made into a well flavored ice cream."

Some improved dairy tests and methods, G. H. BENKENDORF, A. T. BRUHN, A. C. BAER, and J. L. SAMMIS (*Wisconsin Sta. Bul. 241 (1914), pp. 3–19, figs. 10*).—A method for determining the overrun in ice cream is described, which consists of melting 50 cc. of ice cream with 200 cc. of hot water into a 250-cc. flask, the use of 1 cc. of ether to reduce foam, and the filling of the flask to the 250-cc. mark with a known amount of water, this last portion of water and the 1 cc. of ether constituting the reduction in the volume of ice cream, or when compared with the volume of mix before freezing, the percentage of overrun.

A burette for calibrating Babcock test bottles is described. By means of this burette the fat percentage rather than the number of cubic centimeters can be read directly on the neck of the test bottle. A description is also given of a wire cheese curd knife having the advantage of being rigid of form and of cutting even cubes.

It is suggested that attaching a sediment tester to the wall by means of a telephone bracket and within easy reach of the man weighing the milk is a decided advantage.

In cheese-making tests with homogenized milk it was found that the homogenized milk curds were very fragile and easily broken by the curd knives and in stirring. During the salting and curing, the brick cheese formed rinds, which cracked, split open, and peeled off in layers about one-fourth of an inch thick, which would admit flies and dirt. After curing about four weeks, the cheese was poor in flavor and when cut was found to contain large internal cracks and a few mechanical holes, but none of the small round holes always present in good brick cheese. It scored considerably lower than that from ordinary milk. Unsatisfactory results were also obtained with American, Swiss, and limburger cheeses. Further study as to why homogenized milk should give cheese showing these defects is in progress.

VETERINARY MEDICINE.

Clinical bacteriology and vaccine therapy for veterinary surgeons, W. SCOTT (*London, 1913, pp. XIV+222, pls. 12, figs. 37*).—This work deals with the laboratory equipment; preparation of culture media; cultivation of bacteria; staining methods and stains; identification of bacteria—general principles; glass work requisites and how to make them; the elements of the blood which protect the animal body from pathogenic bacteria; vaccines and their mode of preparation; the syringe; phenomena following active immunization by vaccines; sera and their mode of preparation; special diseases, caused by specific bacteria, which are suitable for treatment by serovaccine therapy—bacterial diseases affecting the cutaneous system; bacterial diseases affecting synovial joints, the abdominal organs, the circulatory system, and the nervous system; diseases of the respiratory organs; swine fever; serovaccine therapy in Holland and other countries; weights and measures, etc.

Acid-fast bacilli occurring in the feces of some vertebrates, M. BERTANI (*Centbl. Bakt. [etc.], 1. Abt., Orig., 72 (1913), No. 4–5, pp. 270–273*).—In

investigations including cattle, swine, horses, rodents, birds, and other vertebrates, three nonpathogenic acid-fast species were isolated. Their cultural characteristics and mode of isolation are described.

Some structural transformations of the blood cells of vertebrates, G. L. KITE (*Jour. Infect. Diseases, 15 (1914), No. 2, pp. 319–330, pl. 1, figs. 2*).—Through the employment of a special mounting or culture medium the author has been enabled to determine that both white cells and erythrocytes of all classes of vertebrates may undergo many marked structural transformations of a reversible nature. In this paper the more important of these transformations so far observed are described.

Effect of poisons on the germ cells of the male (*Wisconsin Sta. Bul. 240 (1914), pp. 34, 35*).—In studies by L. J. Cole, alcoholic and lead poisoning of rabbits resulted in lessened vitality in the males and in their offspring.

The behavior of body temperature before, during, and after parturition with the bovine, sheep, and goat, M. LIMMER (*Ueber das Verhalten der Körpertemperatur vor, während und nach der Geburt bei Rind, Schaf und Ziege. Inaug. Diss., Univ. Leipsic, 1912, pp. 124, pls. 5*).—The results are reported of an investigation of taking numerous temperatures before and during pregnancy of bovines, sheep, and goats for the purpose of determining the value of the procedure for diagnosing the time of parturition.

An anteparturient rise takes place most markedly in bovines, and very often the temperature rises above what is usually assumed to be a physiological limit. In the goat and sheep the temperature rise is not so regular and rarely reaches a physiological hyperthermia, although in the goat, the second phase of the temperature rise is more definite and resembles that of the bovine. After a rise in temperature takes place in either of the animals, a fall in temperature is noted which in the bovine takes about two days. In the sheep it is very slow.

The temperature as an indicator for time of birth seems to be of practical and scientific value for the bovine but not for the sheep, and for economic reasons need not be considered for goats.

The significance and the origin of the so-called defensive ferments, E. ABDERHALDEN (*Deut. Med. Wchnschr., 40 (1914), No. 6, pp. 268–270*).—The organs are deemed responsible for the enzym action and not the leucocytes. Castrated animals do not yield ferments for testicle substance when injected with the inactivated press juice of the testicle. Neither pancreas nor intestinal substance can be considered a single protein and when injected they will yield several enzyms.

This method may be of special value for determining the defensive powers of the body toward invading organisms.

The article constitutes a reply to various authors as to the objections which have been raised against the method.

Animal experimental investigations in regard to the specificity of defensive ferments, P. HIRSCH (*Deut. Med. Wchnschr., 40 (1914), No. 6, pp. 270, 271*).—The results show that after the parenteral introduction of placenta and carcinoma tissues from the uterus, defensive ferments are produced which cleave placenta tissue but not uterine carcinoma tissue. On the other hand, the sera from carcinomatous animals cleave only carcinoma tissue.

Further experiments are in progress in regard to carcinoma and sarcoma.

Experimental investigation about autoserotherapy, G. EISNER (*Ztschr. Klin. Med., 76 (1912), No. 1–2, pp. 34–44, pl. 1; abs. in Zentbl. Biochem. u. Biophys., 14 (1912), No. 1–2, pp. 74, 75*).—In none of the 19 cases was a rise in temperature noted. The leucocyte curve, however, was positive and in almost all cases when sterile exudates were used the curve rose. The fastigium was reached four days after the injection. Pus from tuberculosis subjects induces

a rapid rise of the leucocytes which falls back rapidly. This increase in leucocytes is independent of the rise in temperature. Apparently the sera act specifically upon the leucocyte-producing organs.

Serodiagnosis according to Abderhalden, ALLMANN (*Deut. Med. Wchnschr., 40 (1914), No. 6, pp. 271–274*).—With pregnant subjects the results were uniformly positive and in myoma negative. With carcinoma of the genitals and other inflammations the results were questionable.

Adsorption phenomena in the Abderhalden dialysis method, F. PLAUT (*München. Med. Wchnschr., 61 (1914), No. 5, pp. 238–241*).—The presence of inorganic substances incapable of cleaving proteins by themselves, such as talc, barium sulphate, and infusorial earth, was found to produce an increase of substances in the dialyzate which gave the ninhydrin reaction.

The cases which were in man were mostly nervous disorders.

About the specificity of Abderhalden's dialysis method, H. SINGER (*München. Med. Wchnschr., 61 (1914), No. 7, pp. 350–352*).—The results show that if the blood of healthy male rabbits is injected intravenously or subcutaneously into the same or another kind of animal, ferments are elaborated which shortly after will cleave rabbit placenta, liver, and muscle tissue. The same results were obtained with a man who received his own serum intravenously from one to two hours after drawing.

The ferments present in the body are said to be "groupe specific."

Notes about the utility of the dialyzing method in clinical and biological questions, E. ABDERHALDEN (*München. Med. Wchnschr., 61 (1914), No. 5, pp. 233–238, fig. 1*).—In this article the author points out some of the reasons for the inconcordant results obtained by the Abderhalden method.

It often happens that about 50 per cent of the dialyzing thimbles (diffusion shells) sold are faulty inasmuch as they allow the passage of undenaturized protein. Some of the shells are especially sensitive toward boiling water. The biuret test is preferred for the natural protein while the ninhydrin test is recommended for the cleavage products. The test may also be conducted by removing the undigested protein with precipitating reagents or with the ultrafilter of Bechhold.

A second source of error in the method is the use of an unsatisfactory substratum. The substratum must above all things be free from blood and diffusible products. The results obtained from organs other than placenta and tissues from pathological cases are discussed. When the method is used for diagnosing tumors or cancers, only the specific substratum should be used. Organs from another species of animals may eventually be used, but as our state of knowledge in this direction is not complete, it is advisable to use only species specific organs.

The work of other authors is critically discussed, and it is emphasized that when the results with the method are reported they should be accompanied by the other clinical findings.

The serodiagnosis of infectious diseases with the aid of Abderhalden's dialyzing method, E. VOELKEL (*München. Med. Wchnschr., 61 (1914), No. 7, pp. 349, 350*).—This describes tests made with diphtheria, anthrax, and typhoid bacteria, nagana trypanosomes, and *Spirochæta pallida* as substrata for diagnosing the respective diseases caused by the organisms named.

Satisfactory results were obtained with typhoid bacilli and *S. pallida*, and in some cases with the serum protein of luetic subjects. The complement fixation (Wassermann's reaction) showed positive in almost every case in which the dialysis method showed the same condition. All luetic sera protein can not be used for the dialysis test.

About the hemolytic powers of the anthrax bacillus and the saprophytes similar to the anthrax bacillus, K. JÁRMAI (*Centbl. Bakt. [etc.], 1. Abt., Orig., 70 (1913), No. 1–2, pp. 72–80, pl. 1*).—Several investigators have noted that *Bacillus anthracis* has weak hemolyzing properties, and according to Burow, rabbits and guinea pigs affected with anthrax give evidences of a destruction of their erythrocytes in the course of the disease. Hutyra noted that *B. pseudoanthracis* and *B. anthracoides* hemolyze red blood cells in bouillon cultures. As these two micro-organisms are apathogenic, there apparently seems to be a contradiction as to the relation of hemolysis to pathogenicity. The micro-organisms studied in this investigation were *B. anthracis*, *B. pseudoanthracis*, *B. anthracoides*, and *B. anthracis similis*.

The slight hemolysin production of the anthrax bacillus is said to be due to its capsule, which possibly may hinder the secretion of the hemolysin into the culture fluid. The saprophytic organisms can best be differentiated from the anthrax bacillus by noting their hemolytic properties, and this can be done by observing the colonies on the blood agar plates; these, in contradistinction to the anthrax bacillus, show zones of hemolysis surrounding the colonies.

The blood of animals affected with anthrax gives a positive Ascoli reaction six hours after death. The red blood cells of animals affected with anthrax show no change but after death, when capsule formation could not take place, they are apparently acted upon by the anthrax bacillus; consequently the hemolysis noted in cadavers is a post-mortem phenomenon.

Results and outlook of the thermoprecipitin reaction, A. ASCOLI (*Arch. Path. Anat. u. Physiol. [Virchow], 213 (1913), No. 2–3, pp. 181–233, figs. 5*).—This deals with the evolution of M. Ascoli's reaction for diagnosing anthrax, and discusses succinctly the various phases of the topic under the following headings: The precipitating serum (preparation, standardization, and conservation), specificity, the material to be examined, the extracts of organs for the precipitin reaction, conducting the reaction (in the well-appointed laboratory and by the veterinarian in everyday practice), examination of bovines, pigs, horses, etc., further uses of the reaction in examining foods, in forensic medicine, hog erysipelas, blackleg, paratyphoid and meat poisoning, tuberculosis, and Malta fever, and the possible future use of the reaction for hog cholera, typhoid fever, etc.

A large bibliography accompanies the article.

Contribution to elucidating open questions in regard to anthrax and combating this disease, W. BUROW (*Beiträge zur Klärung offener Fragen beim Milzbrand und seiner Bekämpfung. Berlin, 1912, pp. 88, figs. 3*).—This is the text of an address given before the council of the Royal Veterinary High School at Dresden as a part of the requirements to gain the right to teach at that institution. It discusses and gives the reasons for the occurrence of the disease in certain animals and under certain conditions, and deals with the methods of protective and curative vaccination, the precautions to be observed when vaccinating, and the causes for failure in some cases.

Investigations in regard to the etiology of foot-and-mouth disease.—The cause and active immunization, SIEGEL (*Berlin. Tierärztl. Wchnschr., 30 (1914), Nos. 1, pp. 1–3; 2, pp. 25–27*).—The work of the Imperial Health Department (E. S. R., 31, p. 282) is criticized inasmuch as no experiments were conducted in regard to the presence of micro-organisms in the blood, the presence of cocci in the undeveloped vesicles, or the filterability of the virus. The results obtained in the infection tests point to specific properties of the cocci although the lesions present in the mucous membrane of the mouth were only a modified form of foot-and-mouth disease. Many cases of natural foot-and-mouth disease occur in which blebs are not present.

The cocci previously reported (E. S. R., 28, p. 376) were found to be present in the blood of every fresh case of the disease, especially at the time when the fever was on the rise and before the eruption of the vesicles. In sections of vesicles not fully developed the organisms were noted but not in a fully developed state. The biologic and morphologic characteristics of these microorganisms are hard to determine, and among a group of the pathogenic cocci there are always others which are morphologically identical but can not be differentiated by the ordinary means. Certain characterisics were noted, however, and these consisted of (1) the property possessed by the organism of passing through a filter; (2) the development of first generations into definite cocci or streptococci when taken directly from the animal and inoculated into spleen bouillon; and (3) the intracellular growth which differentiates them from *Staphylococcus pyogenes*.

While we have no very definite information in regard to the best procedure for actively immunizing bovines against this disease, it would seem that it is best to select an attenuated virus which does not produce a marked form of the disease.

Remarks in regard to the article noted above by Sanitary Councilor Dr. Siegel, VON OSTERTAG (*Berlin. Tierärztl. Wchnschr., 30 (1914), No. 2, pp. 27, 28*).—A short reply to the above.

The deliberation of the German Agricultural Council with regard to the present status of combating foot-and-mouth disease (*Molk. Ztg. Berlin, 24 (1914), No. 7, pp. 69, 70*).—Addresses and discussions by Löffler, von Nathusius, Brieger, Nevermann, and Krause are given.

Reinvestigation of mallein in the horse establishments of northern Caucasus, GORDSJALKOWSKY (*Vet. Vrach, 1913, No. 35–36; abs. in Berlin. Tierärztl. Wchnschr., 29 (1913), No. 48, pp. 860, 861*).—As the result of studying the value of mallein for diagnosing occult glanders, it is concluded that healthy horses sometimes give a reaction with mallein which in some cases is hard to differentiate from the real positive reaction. Consequently glanders should be diagnosed finally on the basis of the clinical symptoms.

Some diseases of animals caused by bacilli of the hemorrhagic septicemia and colon groups, H. ZEISS (*Arch. Hyg., 82 (1914), No. 1, pp. 1–32; abs. in Rev. Bact., 4 (1914), No. 2, p. 24*).—The author describes an outbreak of a disease among canaries in which an organism was isolated that belonged to the hemorrhagic septicemia group and resembled the fowl cholera bacillus. A bacillus which appears to be the same was isolated in pure culture from a tubercular-like abscess in a rabbit. A bacillus closely resembling *Bacillus coli communis* was isolated in an outbreak of disease among chickens.

Capsule formation by the bacteria of hemorrhagic septicemia, P. B. HADLEY, RUTH BRYANT, and MARGUERITE ELKINS (*Centbl. Bakt. [etc.], 1. Abt., Orig., 72 (1914), No. 6–7, pp. 478–480*).—Among 17 cultures examined by Gozony's India ink method,[a] all of which were known by cultural tests and by animal inoculations to belong to the fowl cholera group, not one was found that gave the slightest suggestion of capsule formation. At the same time capsulated ink bacteria and other capsulated organisms added to the ink for control purposes were demonstrated.

In view of the results the authors conclude that it can scarcely be doubted that the bacteria seen and described by Gozony were not bacteria of hemorrhagic septicemia.

Necrotic stomatitis, I. E. NEWSOM (*Colorado Sta. Bul. 197 (1914), pp. 11–20, figs. 3*).—This paper presents accounts of calf diphtheria, sore mouth disease

[a] Centbl. Bakt. [etc.], 1. Abt., Orig., 68 (1913), No. 7, pp. 594–597.

in pigs, and lip and leg ulceration in sheep. These diseases are said to have caused widespread loss in Colorado during the past ten years.

In regard to the etiology of rabies, F. PROESCHER (*Berlin. Klin. Wchnschr., 50 (1913), No. 14, pp. 633–636, figs. 17; abs. in Ztschr. Immunitätsf. u. Expt. Ther., II, Ref., 7 (1913), No. 5, p. 228*).—With the aid of the antiformin test a microscopically visible organism was noted in the brain of rabid animals and man.

The methods for protectively vaccinating against rabies, N. POKSCHISCHEWSKY (*Ztschr. Hyg. u. Infcktionskrank., 76 (1914), No. 3, pp. 453–468*).—After reviewing the work of others, including that of Miessner, Kliem, and Kapfberger, and Pfeiler and Kapfberger (E. S. R., 30, pp. 281, 282), the results of the author's work, which was done for the purpose of determining whether it was possible by the original Pasteur method and the intraperitoneal injection of fresh brain substance from passage rabbits to immunize negatively experimental animals, chiefly dogs, are reported.

The results show that the original and the modified Pasteur methods are not efficacious for immunizing dogs against a subdural or intramuscular infection with a rabies virus.

In testing experimental animals as regards immunization it is necessary to use satisfactory methods of infection such as the subdural and intramuscular methods with street virus. The intraocular method is not reliable and uncertain results are always obtained by subcutaneous application and by the bite of a rabid animal. The intraperitoneal method with large doses of fixed virus gave a certain active immunity in dogs and rabbits. The immunity was tested with an intramuscular injection of street virus. Only one-half of the cases immunized intraperitoneally were proof against a subdural infection.

The treatment of tetanus by antitetanic serum, E. E. IRONS (*Jour. Infect. Diseases, 15 (1914), No. 2, pp. 367–377*).—An analysis of 225 cases treated during the period 1907 to 1913 shows the mortality of tetanus treated by tetanus antitoxin to be about 20 per cent lower than the average mortality of tetanus treated without serum. The mortality of the cases treated by efficient methods and adequate doses is considerably lower than that of cases receiving small doses subcutaneously.

On the American method of standardizing tetanus antitoxin, A. MACCONKEY (*Jour. Hyg. [Cambridge], 13 (1914), No. 4, pp. 467–492*).—This is a study of the American method (E. S. R., 20, p. 379) of standardizing tetanus antitoxin. In the experiments two standard toxins were examined. It was found "that, provided control experiments are carried out from time to time (as in the case of standard diphtheria toxin), this method of standardizing tetanus antitoxin is—as claimed for it—simple, accurate, and reliable."

Gosio's vital reaction for the tubercle bacillus, S. BELFANTI (*Ztschr. Chemother., I, Orig., 1 (1912), No. 2, pp. 113–121, figs. 2; abs. in Zentbl. Biochem. u. Biophys., 14 (1913), No. 22, p. 878*).—Living tubercle bacilli of the human, bovine, and avian types strongly reduce potassium tellurate. The intensity of the reaction is proportional to the vitality of the organisms. In addition to the reducing properties, the tubercle bacillus possesses synthesizing powers toward tellurium salts. Compounds are produced which possess a garlic-like odor.

Precipitating action of blood serum with lipoids of the tubercle bacillus, L. PRETI (*Münchcn. Med. Wchnschr., 61 (1914), No. 5, p. 241*).—It was observed that when an emulsion of the lipoidlike substances obtained by extraction of 1 to 2 months' old tubercle bacilli with alcohol and ether was added to the blood serum of patients affected with tuberculosis, a marked precipitate was

obtained in about 6 hours. The test was tried with 100 subjects, 64 of which were positively tuberculous. Fifty-three of the 64 gave a positive reaction.

The bovine tubercle bacilli in tubercular pathologic changes and the relation of bovine tuberculosis to human tuberculosis, E. BERTARELLI (*Centbl. Bakt. [etc.], 1. Abt., Orig., 70 (1913), No. 1–2, pp. 10, 11*).—The separation of tubercle bacilli into human and bovine types is regarded as a very indefinite classification. Many bacilli noted in man and which have the characteristics of the bovine type of bacilli are in reality the human type of organism.

Notes and observations on twenty cases of tuberculosis, W. CAUDWELL (*Vet. Rec., 26 (1914), No. 1334, pp. 491–496*).—These notes deal with work conducted under the Tuberculosis Order of 1913 (Great Britain). The cases are divided into two categories, those confirmed by clinical and other evidences and those which were not confirmed. Some of the cows were in milk.

In 12 of the clinically certain tuberculosis cases the lungs and bronchial and mediastinal glands were diseased. In 9 cases the mediastinal glands were affected and the liver was diseased in 6. In 1 case the heart and pericardium were diseased. Tuberculosis was rarely found on the surface of the spleen, but the uterus was often diseased. Two cases had affected mammary glands.

A discussion of the paper at a meeting of the South Eastern Veterinary Association is included.

Bovine tuberculosis, S. DELEPINE (*Separate from Proc. Nat. Vet. Assoc., 30 (1912), pp. 11*).—The investigations reported were conducted in Cheshire, Lancashire, and Aberdeenshire from 1897 to 1899. Statistics are given of 379 bovines which were treated with tuberculin and after death submitted to autopsy.

When classified according to age it was found that among animals up to 1 year of age 3.4 per cent were tuberculous; 1 to 2 years, 13.2; 2 to 3 years, 24.1; 3 to 5 years, 23.5; 5 to 9 years, 48.9; and 9 to 13 years, 76 per cent. In Great Britain during 1910 among 1,319,562 bovines of 1 to 2 years of age, 200,582 were found tuberculous, and among 4,120,813 animals over 2 years old, 1,483,492 were tuberculous.

The mode of infection in bovines is from bovine to bovine and this may be brought about directly or indirectly. The construction and ventilation of the buildings in which animals are kept are deemed of great importance in obtaining milk free from tubercle bacilli. Plans are presented for eliminating tuberculosis from herds on the basis of the tuberculin test and the removal of the animals.

Some facts about brain and retropharyngeal gland tuberculosis in the bovine, KNESE (*Berlin. Tierärztl. Wchnschr., 30 (1914), No. 1, pp. 3–5*).—The author emphasizes the fact that tuberculosis of the brain often occurs in bovines from 3 months to 1 year in age. In animals not affected with abdominal (visceral) or pulmonary tuberculosis the brain as a focus of the disease is often overlooked. The retropharyngeal lymph glands as a focus for this pathologic condition have also been too little considered in looking for tuberculosis in young animals.

An outbreak of tuberculosis in pigeons, F. S. JONES (*Amer. Vet. Rev., 44 (1914), No. 4, pp. 497–500, figs. 3*).—A detailed description of three cases in pigeons from which the tubercle bacillus was isolated. The organisms were alcohol acid fast, thus differing from those studied by Morse (E. S. R., 25, p. 689). The lesions resembled those produced by the avian bacillus.

About the action of antiformin on the tubercle bacillus, DONGES (*Ztschr. Hyg. u. Infektionskrank., 75 (1913), No. 1, pp. 185–192*).—There are strains of

tubercle bacilli from both human and bovine sources which are very resistant toward antiformin. These lose some of their infecting capacity only when exposed for from 12 to 24 hours to concentrated antiformin.

Tuberculosis and Tuberculosan, W. BUROW (*Berlin. Tierärztl. Wchnschr., 29 (1913), No. 48, pp. 854–858*).—A polemic, in which the author claims that the various methods for eradicating tuberculosis are not to be displaced by Burow's method, but are aided by it.

Tuberculosan—Burow, RAUTMANN (*Berlin. Tierärztl. Wchnschr., 29 (1913), No. 41, pp. 729–732*).—This is a critical analysis of a circular sent out by a firm manufacturing Tuberculosan. The preparation, according to the author, has no immunizing properties whatever.

Is the eradication of tuberculosis with Tuberculosan proven? RAUTMANN (*Berlin. Tierärztl. Wchnschr., 30 (1914), No. 3, pp. 43–45*).—This is answered negatively and, according to the author, no specific properties can be attributed to Tuberculosan.

Investigations about complement-fixing antibodies in experimental and spontaneous tuberculosis and also in paratuberculous enteritis, O. BANG and C. W. ANDERSEN (*Centbl. Bakt. [etc.], 1. Abt., Orig., 69 (1913), No. 7, pp. 517–538, figs. 3*).—The sera of tuberculous bovines were found to contain complement-fixing antibodies, and their quantity was in proportion to the gravity of the disease. The complement fixation test is not specific and simply indicates that acid-fast bacilli are present.

The sera from cows affected with paratuberculous enteritis (Johne's disease) behave in the same manner with the complement fixation test as do those from tuberculous cows. The sera from paratuberculous cows contain many antibodies, and in advanced cases where the mammary gland is affected the milk may contain them. In the more severe forms of tuberculosis the milk undoubtedly contains many antibodies.

The sera of rabbits treated subcutaneously with killed or avirulent living tubercle bacilli were found to contain and retain many antibodies for a considerable length of time. Unlike the case of the tuberculous bovine, infection of the rabbit with virulent tubercle bacilli does not induce the formation of large quantities of complement-fixing substances. The rabbits often, when strongly tuberculous, show only a small amount of antibodies.

A good antigen may be prepared with slightly emulsified tubercle bacilli, whereas tuberculin, according to this investigation, is an inferior antigen. Horses, like rabbits, receiving subcutaneous injections of killed tubercle bacilli yield a blood containing much antigen.

Antibodies can also be detected in the blood of birds with the complement fixation test.

Report on actinomycosis (ray fungus disease) and tuberculosis in imported South American ox tongues, E. W. HOPE (*Liverpool, 1914, pp. 20*).—In his report as medical officer of health at the port of Liverpool, the author summarizes investigations based upon examinations of 147,501 South American ox tongues as follows:

"Diseased conditions are present in South American tongues to an extent of 2.5 per cent. No doubt many tongues are rejected by the inspectors in South America, especially those which show extensive lesions in the blade of the tongue. Recent importations show that the majority of these tongues are being more carefully inspected; the glands are frequently incised and properly skewered in position. Actinomycosis (ray fungus disease) is present in South American tongues, and must be fairly prevalent among the cattle. Tuberculosis is also present among these infected South American tongues; all those glands which showed caseous or calcareo-caseous nodules were submitted to

experimental examination with the result that 67.7 per cent produced generalized tuberculosis in guinea pigs. Seven cases of mixed infection (actinomycosis and tuberculosis) were found.

"From the frequent presence of actinomycosis and tuberculosis in the lymphatic glands attached to imported frozen tongues, it has become imperative that importers should see that all the glands are left attached to the tongues."

A brief report upon an examination of South American tongues, by J. M. Beattie (pp. 14–16), and a report upon 46 South American and 2 North American ox tongues and tongue glands examined for actinomycosis and tuberculosis, by D. M. Alexander (pp. 17–20) are appended.

[Work of the government bacteriologist in vaccinating against tick fever, pleuro-pneumonia, and blackleg]. C. J. Pound (*Ann. Rpt. Dept. Agr. and Stock [Queensland], 1912–13, pp. 85–87*).—A short account of the results obtained during 1912–13 from immunizing 23,083 animals against tick fever. Many of the animals were inoculated by the owners, and the balance, 9,498, were treated by the officers of the department.

Where the cattle were kept from tick infestation the average mortality was only 2 per cent. "In several instances cattle from clean districts were placed immediately after inoculation in tick-infested and redwater paddocks, and although in each case the owner was advised as to the very great danger which would follow, he stated that he was prepared to take the risk, with the result that the losses were in some instances as high as 50 per cent."

Several steers free from tuberculosis and blackleg, which were immunized against tick fever and whose blood was proved to give a reaction in susceptible cattle, were sold as blood supply animals. In addition some stud animals were immunized. Altogether there were 72 valuable bulls, and one of these died, this being the first fatal case out of 200 animals inoculated at the station. The immunity conferred by injecting blood taken from an animal that has recovered from either naturally or artificially produced fever, while not absolutely perfect, is considered to be of a very high order.

The injection of normal horse serum (the horse is a nonsusceptible animal) into cattle or the administration of quinin subcutaneously or intravenously did not protect the animals against the disease. Specially prepared and tested pleuro-pneumonia virus was supplied during the year for protective vaccination, and 32,420 head of cattle were treated. Several complaints were received with reference to cattle dying after inoculation. Some of the tails of the cattle had to be amputated after inoculation.

Twelve hundred and thirty head of young stock were vaccinated against blackleg.

Effects of tick eradication on the cattle industry of the South, W. F. Ward (*U. S. Dept. Agr., Bur. Anim. Indus., Effects of Tick Eradication on the Cattle Industry of the South, 1914, pp. 26, figs. 8*).—This paper discusses the recent improvements that have taken place in the tick-free areas of the Southern States and suggests methods of improvement which should be adopted as soon as the ticks have been eradicated from any section.

Bighead in sheep, H. J. Frederick (*U. S. Dept. Agr., Bur. Anim. Indus., Bighead in Sheep, 1914, pp. 6*).—This is a report of investigations conducted by this Department in cooperation with the Utah Experiment Station.

Bighead is an affection that has been observed by sheepmen for upwards of 30 years. It is characterized by a sudden swelling of the head and ears and the presence in the swelled portions of the head of a straw-colored serum which often drips from the parts. The affected tissues present a gelatinous appearance, and the swelling is often so severe that the animal's vision is partially

or entirely obscured. This, with a severe irritation of the head, causes the animal to be extremely restless and to walk aimlessly about until exhausted. It occurs in Utah and surrounding States, the greatest losses occurring in southern and central Utah, southern Idaho, eastern Nevada, and western and southern Wyoming. It is a condition induced by severe exertion of sheep during very warm weather, especially after a cold storm or cold night, and is not transmissible from affected to healthy sheep. It attacks all kinds of sheep, both young and old, male and female, but is not common among lambs.

It may be prevented by handling the sheep properly, that is by not driving them too far or too fast on the trail, especially before shearing in the spring. When sheep are affected they should be dropped out of the herd, or the entire band should be held and allowed to rest, in the shade if possible, and be moved only during the cooler parts of the day. Sheep with swelled heads should have their heads anointed with olive oil or vaseline and be kept quiet for from 12 to 24 hours.

Vaccination against sheep pox with sensitized virus, C. DUBOIS (*Rev. Gén. Méd. Vét., 22 (1913), No. 264, pp. 649–661*).—The purpose of these experiments, which were made with young or adult sheep, was to test the efficiency of the vaccine upon breeds of sheep which are very receptive to pox. The animals, 15 in all, were given one-quarter to one-half, and whole doses (0.2 cc.) of vaccine. They were found to be extremely sensitive toward the vaccine and 3 out of 5 receiving the one-quarter dose reacted distinctly. When the entire dose was given, all the animals gave a positive reaction, but although the latter findings speak in favor of giving an entire dose, the symptoms which follow are rather intense.

The lambs and sheep under treatment behaved better than did the ewes. Ewes in lactation, when vaccinated, show a diminution in their milk secretion, but those in a period of gestation rarely abort.

The method produces an immunity which protects animals against an infection such as would be produced when the sheep are kept in contact with naturally diseased animals. The vaccine is without danger and in infected localities the use of the sero-vaccine is advised.

Experimental studies on contagious agalactia (deficiency of milk) in goats and sheep, R. MARRA and N. COCCIANTE (*Gior. R. Soc. Naz. Vet., 61 (1912), Nos. 15, pp. 329–337; 16, pp. 353–360; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1913), No. 4, pp. 608, 609*).—"The writers give first a short review of the various works so far published dealing with the contagious agalactia of sheep and goats and then pass on to a detailed account of the disease. The chief symptoms of the latter are fever, alteration of the lacteal glands, joints, and eyes of the animals; but, as a rule, the former are alone affected.

"The writers were able to produce the malady artificially in healthy sheep by means of subcutaneous injections of the blood or milk filtrate taken from diseased animals. Further, they were able to prepare a serum for immunization against contagious agalactia which has proved to be very efficient."

Interim report of the departmental committee appointed by the Board of Agriculture and Fisheries to inquire into swine fever, with minutes of evidence, index, and appendix (*Bd. Agr. and Fisheries [London], Interim Rpt. Dept. Com. Swine Fever, pts. 1 (1911), pp. 16; 2 (1911), pp. IV+398, figs. 4; 3 (1914), pp. 4+38*).—These reports include the deliberations of the committee appointed to study the following points: "(a) To what extent is it possible for contagion to spread by infective excretions being carried mechanically by attendants and animals other than swine. (b) Whether external parasites, such as certain lice, carry the disease from sick to healthy swine. (c) Whether

pigs which have, to all appearance, recovered from swine fever remain long infective to other swine. (d) Whether apparently healthy pigs which have been exposed to infection are capable of transmitting the disease as carriers. (e) For what period it would be safe to consider swine which have recovered from swine fever to be immune against a further attack. (f) What use, if any, could be made of artificial methods of immunization to expedite the eradication of swine fever? (g) Whether any of the methods which have lately come into use in connection with other diseases could be employed in the diagnosis of nontypical cases of swine fever."

No experimental data are reported, but certain tentative recommendations are made and the opinions of experts and others interviewed by the committee are included.

Hog cholera control, G. H. GLOVER (*Colorado Sta. Bul. 197 (1914), pp. 3–11*).—This popular account includes a discussion of the hog cholera campaign in the San Luis Valley, with a report of work done by the Monte Vista Hog Growers' Association from February 10, 1913, to February 1, 1914.

The preparation of hog cholera immune serum, A. D. FITZGERALD (*Vet. Alumni Quart. [Ohio State Univ.], 1 (1913), No. 1, pp. 5–7*).—A short description of the preparation and standardization of antihog-cholera serum.

Preliminary report on the results of the treatment of 140,000 head of swine with serum-virus in Ohio, P. FISCHER (*Vet. Alumni Quart. [Ohio State Univ.], 1 (1914), No. 3, pp. 64–67*).—The figures given are based upon the compiled reports sent in by owners whose herds were treated during a period of two years, ended November 4, 1912. Approximately 2,000 herds of swine in all parts of the State of Ohio and comprising 140,000 animals were treated by official veterinarians, but reports were received for only 1,762 herds containing 116,714 hogs. The serum-virus treatment was used only for healthy herds.

Of the original number of swine in the herds considered (100,773), 11,056 had died before treatment was applied. There were left untreated on account of supposed infection 9,850, of which 6,321 died from cholera. Also 21,319 had temperatures ranging from 104 to 108° F., indicating the probable presence of infection at the time of treatment and 10,276 died after treatment. Of 2,816 pregnant sows treated, 1,445 were reported as farrowing healthy litters, 473 as having aborted, and 898 sows were not reported.

Compiled reports for the years 1910–11 and 1911–12 on 526 healthy herds comprising 39,958 animals show that 26,997 animals, of which 5,920 showed high temperatures indicating possible infection, received serum-virus treatment; 9 animals received serum-alone treatment; and 14,204 animals were left untreated on account of previous treatment or because they were ready for market or for experimental observation. Of the treated pigs 12 were reported by the owners as having died from what they believed might have been cholera. Six hundred and sixteen apparently healthy pregnant sows were included among the treated animals in the healthy herds, and of these 459 sows were reported as having farrowed healthy litters, 104 were not reported, and 53 sows were reported as having aborted.

These figures show that the danger from serum treatment, so far as causing abortion is concerned, is not serious.

"Since 1908 about 250,000 head of swine have been treated with protective serum (serum alone or serum and virus) under the direction of the state veterinarian with serum prepared in the laboratories of the State Serum Institute."

The results seem to indicate that where the serum-virus method was used in healthy swine, practically perfect results were obtained.

The control of hog cholera by slaughter methods, G. HILTON (*Amer. Vet. Rev., 44 (1914), No. 5, pp. 573–580*).—In Canada the "premises on which this malady is suspected, as well as adjacent ones, are promptly quarantined and measures taken to establish a diagnosis. Directly this is accomplished, all infected and contact hogs are slaughtered. The carcasses of the hogs which have shown evidences of the disease, together with all débris, are cremated, and when this procedure is impracticable they are covered with lime and deeply buried. The apparently healthy hogs are suitably slaughtered on the owner's premises, the carcasses carefully inspected, and a license issued permitting the removal for sale purposes of any which are considered wholesome. It is, however, not customary to remove the carcasses of hogs which have been in direct contact with those showing symptoms of the disease.

"As soon as all carcasses and contact matter have been satisfactorily disposed of, the cleansing and disinfection of the premises is proceeded with; this is done under the supervision of the veterinary inspector in charge of the outbreak, and must be performed in a manner entirely satisfactory to him. Cheap, crudely constructed, insanitary hog houses are burned, while proper measures are taken to disinfect effectively the more modern structures. The yards to which hogs have had access are covered with lime and carefully plowed under, and the trees in the orchards or yards and fences are also disinfected from the ground to a suitable height. No hogs are permitted to be brought to any farm until a period of three months has elapsed from the completion of disinfection."

Compensation is paid only for animals which are slaughtered at the request of the inspector, and "a maximum valuation of $50 is allowed for registered pure-bred hogs, and $15 for grades, the value in each case being adjusted by the inspector whose decision is final."

The distribution of the disease in Canada is also discussed. The importation, manufacture, sale, or use of hog cholera serum is prohibited in Canada.

Suggestions relative to the prevention of hog cholera, J. H. KASTLE and R. GRAHAM (*Kentucky Sta. Bul. 181 (1914), pp. 149–155*).—This paper includes a tabular summary of results obtained from the use of antihog-cholera serum at the station during the month of June, which shows as low a mortality attending and following the inoculation as has been obtained elsewhere in the United States. Of 3,180 hogs treated in 100 herds, reports of which were received, 2,961 or 93.1 per cent survived.

About infectious abortion in pigs and hog cholera, DÖRRWÄCHTER (*Mitt. Ver. Bad. Tierärzte, 12 (1912), No. 10, pp. 149–153*).—During the last few years (1911–12) abortion has occurred in hogs without giving any clue to the causative factors. As a premonitory sign in some animals the vagina was swollen and an exudate was present. In other animals these phenomena were entirely absent, but after abortion in all animals an odorless, grayish-yellow exudate was present. Marked constitutional disarrangement was hardly ever present before abortion took place. The fetuses and the afterbirths were often eaten by the hogs. The boars used for serving the animals in no case showed signs of a diseased condition. The clinical appearances are described in detail in the article with the methods of disinfection and isolation.

A little later a very malignant form of the disease occurred and as a result many sows died. The remarkable part of this enzootic was the presence of an acute endometritis which is often noted in animals affected with hog cholera. The pathologic anatomy resembled endometritis with a subsequent septicemia. The bacteria noted in the uterine secretions at first appeared to be diplococci but closer observation showed them to be bacilli with rounded ends. Whether the organism in question was the *Bacillus abortus* (Bang), *B. suisepticus*, *B. suipestifer*, or *B. bipolaris septicus* was not established.

The Bacillus abortivus equinus as an etiological factor in infectious arthritis of colts, E. S. Good and W. V. Smith (*Jour. Infect. Diseases, 15 (1914), No. 2, pp. 347–349*).—The authors have isolated the organism causing infectious abortion in mares from a colt affected with infectious arthritis. "At the present time it is impossible to say as to what rôle the *B. abortivus equinus* plays in the disease of infectious arthritis of colts, but that it is capable of producing this disease, as are the other germs noted by investigators, is evidenced in this instance."

The etiology of pyemic arthritis in foals, F. W. Schofield (*Jour. Infect. Diseases, 15 (1914), No. 2, pp. 409–416*).—The author's studies of the characteristics of the bacillus which causes pyemic arthritis in foals show it to belong to the colon-typhoid group and to be closely related to *Bacillus paratyphosus* B.

Attention is called to the fact that the organism isolated, and here described, has a very close relationship to the one recently isolated by Good (E. S. R., 29, p. 779) in contagious equine abortion. "In cultures the only difference observed is that the bacillus of equine abortion causes fermentation in raffinose while my organism does not attack this carbohydrate. However, difference in strains would readily account for this. The most convincing evidence that these organisms are but strains of the same species is that they can not be differentiated by means of the complement fixation test. Serums giving complete fixation with antigen prepared from my organism also give fixation in corresponding dilutions with antigen prepared from the bacillus of equine abortion. With characteristics that correspond so closely, these organisms appear to be but strains of the same species, and it is quite probable that the same organism may be responsible for both septic arthritis and abortion. These diseases commonly coexist in the same locality; furthermore, it is of frequent occurrence for a mare to abort one season and during the next to deliver a colt that develops septic arthritis. The more one studies the clinical history of these diseases the more convincing becomes the probability of their common etiology in many instances."

A text-book of horseshoeing for horseshoers and veterinarians, A. Lungwitz and J. W. Adams (*Philadelphia and London, [1913], 11. ed., pp. 216, figs. 229*).—In this eleventh edition of Lungwitz's work, J. W. Adams assumes entire responsibility owing to the author's having reached the age of retirement. In revising the tenth edition, translated in 1904, many chapters have been rewritten and illustrations withdrawn and others added in order to keep pace with the progress in farriery. The effect of weight in the shoe in altering the flight of the foot is discussed, as are rubber pads, so widely used in the United States. Attention is directed to many innovations of more or less value that have appeared during recent years.

The various chapters deal with (1) the gross anatomy of the horse, (2) the foot in its relation to the entire limb, (3) shoeing healthy hoofs, (4) shoeing horses that forge and interfere, (5) winter shoeing, (6) hoof nurture, (7) general remarks concerning the shoeing of defective hoofs and lame horses, (8) inflammations of the pododerm (pododermatitis), (9) defects of the hoof, and (10) shoeing mules, asses, and oxen.

Vaccine treatment of chicken pox in fowls (*Wisconsin Sta. Bul. 240 (1914), pp. 36, 37, fig. 1*).—In experiments with the vaccine treatment of chicken pox, first suggested by Manteufel (E. S. R., 23, p. 792), highly beneficial results were obtained by F. B. Hadley, B. A. Beach, and J. G. Halpin in ailing as well as in healthy fowls.

The vaccines were prepared by grinding diseased tissues, such as pox scabs and affected membranes, and subjecting them to a temperature of 55° C. (131° F.) for one hour. "Four hundred and forty fowls were treated five days apart

by a double vaccination. In this lot only 4 subsequently developed the disease while in 75 unvaccinated controls 26 well-marked cases of chicken pox occurred in three weeks. Although there seems to be a considerable variation in the natural susceptibility of fowls to artificial inoculation, birds treated with the vaccines and placed in infected pens escaped the disease while it was possible to infect controls." See also a previous note (E. S. R., 30, p. 785).

RURAL ENGINEERING.

Irrigation manager and his legal problems, F. H. NEWELL (*Jour. Electricity, 33 (1914), No. 5, pp. 95–100, figs. 4*).—A discussion is given of the water situation in the Western States, particular stress being laid upon the economic use of water as a determining factor in its assignment. Illustrations are given of what are pointed out to be the evils occurring under the desert land and Carey acts and of their elimination by the reclamation act.

Report on irrigation for the year 1913 (*Dept. Int. Canada Ann. Rpt., 1914, pt. 7, pp. 179, pls. 12, figs. 50*).—This is a report on administrative work, inspections of irrigation projects, stream measurements, special hydrographic surveys, and drainage investigations for the year ended March 31, 1913. A special section by H. O. Brown deals with the rating of current meters. Maps and tabular data accompany the report.

Irrigating plant for 625 acres, E. R. FEICHT (*West. Engin., 5 (1914), No. 1, pp. 22–26, figs. 5*).—This article describes the selection of apparatus and its erection and operation for a small irrigating plant in which first cost as well as satisfactory operating results were conditions of vital importance.

Irrigation from tube-wells, F. HUGHES (*Agr. Jour. Egypt, 4 (1914), No. 1, pp. 66–70*).—Results of examinations of well waters and the soils and crops watered by them in Upper and Lower Egypt indicate that "damage to land or crops by the use of well water is rare," but "that water having over 1,000 parts per million of dissolved matter should be avoided when possible."

A weir chart, R. J. BROWER (*Power, 40 (1914), No. 1, p. 9, fig. 1*).—The author explains his idea of a chart applicable to all weirs by which the discharge for any width is readily determined by simple multiplication.

The transportation of débris by running water, G. K. GILBERT and E. C. MURPHY (*U. S. Geol. Survey, Prof. Paper No. 86 (1914), pp. 263, pls. 3, figs. 89; abs. in Jour. Wash. Acad. Sci., 4 (1914), No. 7, pp. 154–158*).—Investigations made to determine the laws which control the movement of bed load of débris, and especially to determine how the quantity of load is related to the stream's slope and discharge and to the degree of comminution of the débris, are reported. In each experiment a specific load of sand and gravel sorted into grades of uniform size was fed to a stream of specific width and discharge.

A competent slope σ limiting transportation was found for each combination of discharge, width, and grade of débris. With lower slopes there was no load and increase of slope increased the débris capacity, which varied as $(S—\sigma)^n$, in which S equals the stream's slope and n ranges from 0.93 to 2.37, the values being greater as the discharges are smaller or the débris coarser. For each combination of width, slope, and grade of débris, there was a competent discharge, k. The capacity varied as $(Q—k)^o$, in which Q is the stream's discharge and o ranged from 0.81 to 1.24, the values being greater as the slopes are smaller or the débris coarser. For each combination of width, slope, and discharge, there was a limiting fineness of debris Φ. The capacity varied with $(F—\Phi)^p$, in which F is the degree of fineness and p ranged from 0.50 to 0.62, the values being greater as slopes and discharges are smaller. For any combination of slope, discharge, and fineness there was a particular ratio of depth to width corresponding to maximum capacity and ranging from

0.5 to 0.04, being greater as slope, discharge, and fineness were less. With constant slope the capacity varied with the 3.2 power of velocity, with constant discharge it varied with the 4.0 power of velocity, and with constant depth with the 3.7 power of velocity.

In general, débris composed of particles of a single size moved less freely than débris containing particles of many sizes. The load, including that carried in suspension and that dragged along the bed, increased the energy by adding its mass to that of the water, and decreased it by restricting the mobility of the water and by the work required in transportation.

Capacities were notably larger for flume transportation than for stream transportation and increased for rolling particles with coarseness and for leaping particles with fineness. Capacities also increased with slope, and usually with discharge, but were reduced by roughness of bed.

The position of the level of maximum velocity was higher in loaded streams as the load was greater, and higher in unloaded streams as the slope was steeper, the discharge greater, and the bed rougher.

The constant of the Pitot velocity gage (the ratio between the head realized and the theoretical velocity head) was found to be not the same in all parts of a conduit, being less near the water surface and greater near the bottom or side.

Subirrigation and drainage for golf greens (*Engin. News, 72 (1914), No. 4, pp. 199, 200, figs. 3*).—A system is described and illustrated.

Drainage of Shoshone irrigation project, D. W. MURPHY (*Engin. Rec., 69 (1914), No. 23, pp. 634–636, figs. 6*).—This article describes the construction of a system of closed and open drains which was made necessary by the rising water table and the rapidly increasing area of water-logged soil. Cost data on excavation with the dragline scraper and the ditch excavator are also given.

Reclamation of alkali lands, F. B. HEADLEY (*U. S. Dept. Agr., Bur. Plant Indus., Work Truckee-Carson Expt. Farm 1913, pp. 11–14, fig. 1*).—The porosity of soils made impervious to water by an excess of alkali salts was greatly increased by treatment with either gypsum or quicklime. Gypsum is concluded to be the more desirable of the two.

For the reclamation of alkali soils a drainage system of redwood 2,620 ft. long was constructed at an average depth of 4½ to 5 ft. The drainage water is pumped from a sump by a 3-in. centrifugal pump, discharging slightly over ½ cu. ft. of water per second, and operated by an electric motor. It was found that each watt of electricity used pumped 1.195 second-feet of water.

The total alkali salts removed by the drainage system is shown in the following table:

Quantity of electricity used and of water and total salts pumped by the drainage system of the Truckee-Carson Experiment Farm in 1913.

Month.	Electricity.	Water pumped.		Average salts.	Salts pumped.
	Kilowatts.	*Cubic feet.*	*Pounds.*	*Per cent.*	*Pounds.*
January	18	21,510	1,344,375	0.250	3,361
February	26	31,070	1,941,875	.229	4,641
March	60	71,700	4,481,250	.232	10,397
April	100	119,500	7,468,750	.285	21,286
May	125	149,375	9,335,937	.323	30,155
June	66	78,870	4,929,375	.296	14,591
July	38	45,410	2,838,125	.247	7,010
August	28	33,460	2,091,250	.196	4,099
September	34	40,630	2,539,375	.184	4,672
October	30	35,850	2,240,625	.179	4,011
November	24	28,680	1,792,500	.187	3,352
December	29	34,655	2,165,937	.183	3,963
Total	.....	690,710	43,169,374	.....	111,538

Electricity versus steam in drainage pumping (*Elect. World, 64 (1914), No. 6, pp. 275–277, figs. 4*).—Data on first cost and operating expenses of steam and electrically driven pumping stations used for draining agricultural lands along the Illinois and Mississippi rivers are given. They show that the cost of building a modern electrical pumping station varies from 50 to 60 per cent of the cost of building a steam station to do the same work. It is claimed to have been established that the total operating expense for electrical pumping stations for drainage district service is from 10 to 35 per cent less than the total operating expense of steam stations under the same conditions.

Construction and maintenance of sand-clay roads in Georgia—methods and cost, J. C. Koch (*Engin. and Contract., 42 (1914), No. 5, pp. 107–111, figs. 7*).—This article gives detailed methods and costs of both construction and maintenance of sand-clay roads in Georgia, using top soil, other natural sand clays, and artificially mixed sand clay for surfacing.

Standard cross sections for Illinois roads (*Engin. and Contract., 42 (1914), No. 5, pp. 111–113, figs. 4*).—Cross sections for macadam, brick, and concrete roads used in the construction of roads in Illinois in 1914 are given, with the reasons for their adoption.

The organization and standards of the Iowa Highway Commission (*Engin. and Contract., 42 (1914), No. 3, pp. 55–58, figs. 14*).—This article describes the organization of the Iowa Highway Commission and gives illustrations of the road and culvert standards adopted by them.

Standard I-beam and pile highway bridges of the Iowa State Highway Commission (*Engin. and Contract., 42 (1914), No. 5, pp. 102–104, figs. 3*).—This article gives design drawings and essential data for standard I-beam and pile highway bridges of this commission, as well as drawings of standard pile abutments for steel highway bridges.

Experiments on the effect of compression on a small gas engine, E. G. Roehm and W. W. Tangemann (*Gas Engine, 16 (1914), No. 7, pp. 413–420, figs. 10*).—A series of tests on a vertical single-cylinder 4-cycle gas engine of $4\frac{3}{4}$-in. bore and $8\frac{1}{2}$-in. stroke, rated at 3 horsepower, hit and miss governed and with mechanically operated valves, is reported. The object was to determine and explain the effect of increasing the compression on the economy.

The degree of compression was varied by changing the clearance volume, which was effected by redesigning the cylinder head and providing for its vertical adjustment by telescoping the head into the cylinder and placing spacer rings under the shoulder, thus obtaining compression ratios ranging from 2.5:1 up to 8.5:1. A large gain in economy as regards gas consumption and thermal efficiency was obtained up to a compression ratio between 5 and 6:1. Above this at all horsepowers the economy tended to decrease. The percentage of total heat in gas absorbed by the jacket water reached a maximum at a compression ratio of 3.5 to 4.5:1, and a minimum between 5 and 6:1. The British thermal units absorbed by the jacket water per brake horsepower hour were least between compression ratios of 5 and 6 to 1, and tended to rise beyond 6:1. The British thermal units per brake horsepower hour appearing as sensible heat in exhaust decreased up to a compression ratio of 6:1 and then increased above 6.5:1. The minimum was reached at lower compression ratios with the higher loads. The maximum horsepower obtained with various compression ratios increased steadily by use of higher compression.

It is concluded that for a gas similar to a natural gas having a high heating value (950 to 1,100 B. T. U. per cubic foot) the most economical operation is obtained by using compression ratios between 5.5 and 6.5:1.

Fuel consumption of gasoline engines (*Wisconsin Sta. Bul. 240 (1914), p. 41*).—A series of tests conducted by F. White with farm engines of from 3 to 6

horsepower to determine the relative economy under different loads indicated that the larger engines are as economical in the use of fuel on a small load as are the smaller engines when carrying the same load.

Gasoline engine troubles and the care and operation of gasoline engines, G. E. P. SMITH (*Arizona Sta. Bul. 71 (1913), pp. 797–814, pl. 1, figs. 5*).—This bulletin is intended primarily for the popular discussion of gasoline engine troubles, but deals in addition with several other important features concerning the care and operation of engines. It deals particularly with 4-cycle engines, which are said to constitute at least 95 per cent of the gasoline engines in use in Arizona. A trouble-hunting chart for gasoline engines is included which takes up in detail troubles in starting and troubles after starting.

In a discussion of fuel consumption it is pointed out that for fuel economy an engine should work close up to its rated load, and that it is not advisable, therefore, to purchase an engine with much excess of power above the required amount. It is further stated that the fuel consumption for a 10-horsepower engine, or larger, with good compression should not exceed 1 pint per brake horsepower hour on full rated load, or 1½ pints per brake horsepower hour at one-half load.

Information obtained from investigations of Strong and Stone previously noted (E. S. R., 28, p. 384) regarding the economical adjustment of the needle valve is also given.

Tests of feed mills, H. WIRTH (*Arb. Deut. Sck. Landeskult. Rat. Königr. Böhmen, No. 19 (1914), pp. 52, figs. 13*).—Seven feed mills, including three stone mills, two roller mills, and two toothed disk mills, are described and illustrated and comparative tests, using different grains, are reported. The tests were divided into (1) a comparative accomplishment test of the unused mills, (2) a duration test, and (3) a second accomplishment test of the used mills after being subjected to the first two tests.

The amounts of coarse meal ground exceeded the amounts generally claimed for the machine by the manufacturers, but the amounts of fine meal were generally less than claimed. The power utilization was greater than claimed, and when the mills were running empty varied between 0.22 and 0.53 horsepower.

Only three of the mills were able to grind oats to a fine meal. Generally a better degree of fineness of the ground product was obtained with the stone mills than with the other two types. Any desired degree of fineness of meal was, however, more readily and cheaply obtained with the roller mill, and the toothed disk and roller mills were the more suitable for the production of coarse and medium meal.

The hourly capacity of the roller and toothed disk mills exceeded that of the stone mills, while the stone mills were more easily cleaned and less noisy.

A magnet was satisfactorily used in six of the mills for excluding foreign metal bodies, but the success of this method is found to depend not only on the strength of the magnet but on its arrangement, location, and inclination.

Handling silage, L. W. CHASE and I. D. WOOD (*Nebraska Sta. Bul. 145 (1914), pp. 5–25, figs. 19*).—This bulletin gives general information regarding cutting and loading corn for silage, silage cutters and cutting, filling and sealing silos, and removing silage from pit and above-ground silos by means of hand, horse, and mechanical power, and general cost data on silo filling.

For cutting corn the use of corn knives is considered advisable only on very small jobs and then only when sled harvesters or corn binders are not available. The sled harvester is said to be probably the cheapest of the three methods, but the corn binder is considered to be the most satisfactory.

The cost of cutting and loading by means of the sled harvester was found to be $1.28 per acre in one case and $1.98 per acre, or $0.259 per ton in another. The cost of cutting corn with a corn binder on 16 Nebraska farms and of delivering it bound was about $1.77 per acre or $0.236 per ton. Power cutters with fan blowers are considered to be always advisable where many large silos are to be filled. The drag carrier may be used successfully in filling pit and semipit silos but is not successful where a long carrier is required or in windy countries unless the carrier is covered.

A description and illustration of a simple homemade hand hoist for pit and semipit silos is appended.

Concrete silos (*Chicago, Pittsburgh, and Minneapolis, 1914, pp. 104, figs. 76*).—This is a pamphlet of practical information for the use of farmers and rural contractors regarding the construction of monolithic concrete and concrete block silos and concrete silo water tanks. A large amount of specific data is given accompanied by diagrammatic illustrations.

The construction and equipment of dairy barns, W. D. Nicholls (*Kentucky Sta. Bul. 179 (1914), pp. 37–112, figs. 46*).—This bulletin gives information to dairymen on the construction and equipment of dairy buildings. In dealing with the subject the author has kept in mind the average farmer of limited capital. A number of detailed plans of dairy buildings are included in which it has been the intention to keep economy and efficiency paramount. Elaborate and costly barns are considered to be unnecessary for permanence, sanitation, comfort of cows, or convenience in the production of clean milk.

It is stated that money invested in a dairy barn should be required to pay at least 10 per cent a year to cover interest, depreciation, taxes, insurance, etc. It is also stated that a good business farmer seldom puts more than $50 per cow in a dairy barn. Labor saving arrangements are emphasized and it is stated that in nearly all cases abundant hay storage should be provided by the construction of a roomy hay loft over the first story. This is considered to be by far the cheapest hay storage.

The barn should be large enough to meet the present needs of the farm and to allow for a reasonable growth in crop and stock production, but ordinarily when home grown silage and roughage feeds are produced no more than 60 to 80 cows should be placed in one stable.

The importance is emphasized of so locating the dairy barn as to avoid odors and contamination from hog pens, chicken houses, and other places which are liable to be unclean. It is stated that, if possible, the barn should run north and south so that the sunlight may enter from both sides during the day.

From the standpoint of economy it is considered desirable to have the barn as narrow as possible, consistent with efficiency and sanitation. The advantages and disadvantages of timber and plank framing for the dairy barn are discussed and the latter arrangement is seemingly favored.

It is considered usually desirable to place the cows in two rows. The plan of facing the cows inward may be used to advantage when the greatest economy of floor space is desired since it permits the use of a narrow barn. With the cows facing outward a wide barn is necessary, but this width permits a driveway wide enough for a team to be driven through from end to end, thus loading the manure directly from gutter to wagon or spreader. The standard width of a cow stall is 3½ ft., and for small cows like the Jersey the length of the stall from gutter to manager should be 4½ ft., for long cows like the Holstein or Shorthorn, 5 ft., and for very long cows, 5½ ft.

Other desirable features are described and illustrated, and the importance of a plentiful supply of water for the cows is especially emphasized.

An extensive section gives costs and bills of material for a number of the barns described.

The dairy barn at the Kentucky Agricultural Experiment Station, J. J. HOOPER (*Kentucky Sta. Bul. 179 (1914), pp. 113–117, figs. 4*).—This barn is described and illustrated.

Making a poultry house, M. R. CONOVER (*New York, 1913, pp. 54, pls. 8, figs. 4*).—This book treats in a popular manner with the planning and construction of poultry houses, dealing specifically with such features as floors, foundations, walks, windows, ventilation, doors, nests, roosts, and runs.

Figuring radiation for kitchens using gas fuel, J. A. DONNELLY (*Dom. Engin., 68 (1914), No. 5, pp. 127, 128*).—A formula is suggested for calculating the necessary amount of radiation for heating rooms by hot water which is particularly applicable to kitchens.

[**Sanitation**] (*Biennial Rpt. Bd. Health Minn., 1911–12, pp. 439–450, figs. 10*).—This section treats briefly with the disposal of dairy, residential, and school sewage, and gives plans for sewage-disposal apparatus. Suggestions are also presented for constructing an Imhoff tank and for converting a septic tank into an Imhoff tank.

Local venting of plumbing v. safety first, I. A. MANN (*Dom. Engin., 68 (1914), No. 6, pp. 152–155, figs. 5*).—The author discusses the subject from the bacteriological standpoint and concludes that local vents in sanitary plumbing systems are wasteful, expensive, unnecessary, and dangerous.

The relation of methods of disposal of sewage to the spread of pellagra, J. F. SIELER, P. E. GARRISON, and W. J. MACNEAL (*Proc. Soc. Expt. Biol. and Med., 11 (1914), No. 3, pp. 94, 95*).—In this summary of their work, the authors state that, judging from their field studies, "pellagra has spread most readily in communities in which unscreened surface privies were in use. . . . In two mill villages completely equipped with a water carriage sewer system, it was impossible to find cases of pellagra which had certainly originated there. Individuals suffering from pellagra contracted elsewhere were not lacking in these communities."

RURAL ECONOMICS.

[**Economic studies**] (*Wisconsin Sta. Bul. 240 (1914), pp. 4–18, figs. 7*).—A chart showing the distribution of the price paid by the consumer for Cheddar cheese among producer and middleman (E. S. R., 29, p. 675) is presented and discussed, together with data in regard to the marketing of potatoes. The two main services which must be rendered in marketing potatoes are the storing of the supply harvested in one month in order that there may be potatoes for the remainder of the year, and distributing the surplus potatoes of the principal potato districts to regions where fewer potatoes are produced than consumed. The storing of potatoes is a function mainly performed by the producer. The work of the local dealers is largely that of sorting and loading into cars. It was found that generally there were too many warehouses at each shipping station for their economic handling. However, many local dealers handle lumber, feed, and machinery in addition to potatoes.

The station is also making a detailed study of rural credit in Dane and Rusk counties as illustrating the diversity of conditions existing in the State. It is also investigating the methods employed by the local banks in meeting the requirements of local rural credit.

Among the conclusions drawn from other studies were that on two farms the value of manure did not pay for the labor of feeding, milking, and caring for the dairy herd, and that those farmers who had increased their investment in

operating capital are realizing greater profits than those operating their farms less intensively. From rural social surveys made in different parts of the State it is concluded that the village or small city of the agricultural type in Wisconsin is the center of a real rural community, that a certain area of land surrounding this village or small city is as necessary to it as is the land under its dwellings, shops, and stores, and that the major interests of the farm family on this adjacent area of land are identical with those of the dwellers in the village or small city trading center.

An investigation of piece wage in agriculture, von ESDEN-TEMPSKI (*Landw. Jahrb., 46 (1914), No. 3, pp. 455–498*).—The author describes the influence of payment by the piece upon agricultural laborers hired by the year, the seasonal or migratory laborers and free laborers, and methods of determining the payment. He apparently believes it puts a premium upon skill, but requires a very careful arrangement and analysis of the farm operations to be administered successfully.

The movement of wheat prices and its causes, L. PERIMANN (*Schr. Ver. Sozialpolit., 139 (1914), pt. 3, pp. 73, figs. 10*).—The author discusses the relative changes in the prices of wheat in Prussia, France, England, and the United States over a long series of years, the various factors influencing the daily, monthly, and yearly fluctuations, and the relation of the price of wheat to the general price movement.

Markets and rural economics, T. J. BROOKS (*New York, 1914, pp. 397*).—The author discusses the agencies controlling prices, methods of marketing, cooperation, rural credit, cost of living, and their relationship to farming and the farmers. A brief bibliography is included.

Farmers' market bulletin (*Farmers' Market Bul. [N. C.], 1914, Nos. 1, pp. 16; 2, pp. 19; 3, pp. 79*).—According to Bulletin 1, if the farmer is to take any part in the business of marketing his own produce, there must be (1) an organization to grow a uniform product within each community, (2) an organization to gather information from the farmers who have products for sale and to distribute this to possible buyers, (3) an organization for obtaining information of prices of different markets and for distributing this information to all producers, and (4) an organization to distribute to a central agency for redistribution all orders and inquiries which the individual farmer or farmers' organizations can not fill. The North Carolina Experiment Station in cooperation with the State Department of Agriculture is attempting to perform the function of the central agency. The bulletin also contains regulations for answering all inquiries concerning sale of agricultural products and for listing products in the bulletin, and a list of farmers who have specified products for sale.

Bulletin 2 contains a partial list of fruit and vegetable growers in North Carolina, with acreage and probable shipping dates. Bulletin 3 outlines the organization necessary for the marketing of truck and fruit and gives a list of buyers and the character of business done and products handled by those purchasing such products, not only in North Carolina but in other States.

Proceedings of the seventy-fourth annual meeting of the New York State Agricultural Society (*N. Y. Dept. Agr. Bul. 60 (1914), pp. 1441–1715, pls. 27, fig. 1*).—A number of the discussions at this annual meeting related to the marketing of agricultural products, cooperation, rural credit, drainage, work of farm bureaus, and agricultural education.

Proceedings of the Agricultural Conference and Corn Shown (*Proc. Agr. Conf. and Corn Show, 1913, pp. 269*).—Among the principal topics discussed were the relationships between the farmers and city consumers, methods of

marketing, and improving agricultural production. Several of the speakers gave descriptions of the various agencies working to solve these problems.

Report of the Missouri Country Life Conference, 1914 (*Missouri Bd. Agr. Mo. Bul. 12 (1914), No. 4, pp. 138, figs. 29*).—At this conference were discussed means of improving rural conditions as they have been actually worked out through the school, church, public organizations, and better credit facilities.

Facts and fiction about crops, C. G. HOPKINS (*Science, n. ser. 37 (1913), No. 952, pp. 470–476*).—The author in this article alleges that there are serious discrepancies between the estimates of the U. S. Department of Agriculture and the returns obtained by the Census, and that crop yields have been decreasing.

Statistics of crops, G. F. WARREN (*Science, n. ser., 40 (1914), No. 1021, pp. 121–126, fig. 1*).—The author maintains that there are errors in reasoning in the above article, and gives an explanation for the apparent differences between the estimates of the Department of Agriculture and the Census returns. He calls attention to the fact that by the bringing into cultivation of large areas of land with low yields the average yield for the United States has decreased, but that in the region east of the Mississippi there has been very little change in the farm acreage. Considering the five eastern geographic divisions and the six important crops, corn, wheat, oats, hay and forage, cotton, and potatoes, it is found that in 19 instances the highest rank occurred in 1909 as against 5 instances in 1899, 3 in 1889, and none in 1879.

Agricultural statistics of Ireland, 1913 (*Dept. Agr. and Tech. Instr. Ireland, Agr. Statis. 1913, pp. XXXV+2–145*).—This annual statement contains statistical tables showing the acreage and production of crops, the number of occupiers and holdings, and the number of live stock. Between 1851 and 1913 the acreage in cereal crops decreased from 3,099,401 to 1,263,963 acres, and green crops and flax from 1,513,142 to 1,068,786 acres, while hay increased from 1,246,408 to 2,481,822 acres. The number of holdings under one acre increased from 37,728 to 88,133 and those above one acre decreased from 570,388 to 519,941.

Agriculture under the influence of mining and manufacturing in the Ruhr coal region of the Rhine, W. AVERECK (*Volksw. u. Wirtschaftsgesch. Abhandl., 3. ser., No. 1 (1913), pp. VI+87*).—Between 1882–1907 the number of agricultural establishments increased from 34,163 to 44,221. Those under 2 hectares (5 acres) comprising 91.24 and 94.81 per cent, respectively, of the total number. The land used for agricultural purposes decreased from 37,877 to 28,845 hectares. In 1878 agricultural land comprised 68.6 per cent of the total land surface, whereas in 1907 it comprised only 43.1 per cent. The most marked decrease took place in the pasture and grazing land. The number of horses and swine increased while the number of cattle, sheep, and goats decreased. The increase of the value of land, foodstuffs, and farm animals had a tendency to decrease the profits.

Statistics of agriculture in Switzerland (*Statis. Jahrb. Schweiz, 21 (1912), pp. 58–75*).—Contained in this annual report are statistical data showing for cantons the area, production, and value of the principal agricultural products, the production of butter and cheese, and the number of live stock.

In foreign fields, J. E. WING (*Chicago, 1913, pp. 549, pl. 1, figs. 41*).—This book contains a description of agriculture as noted by the author in his travels through South America and Western Europe. The facts observed relate principally to the sheep industry.

AGRICULTURAL EDUCATION.

The relation of the agricultural college to the state normal school, A. V. STORM (*Addresses and Proc. Nat. Ed. Assoc., 51 (1913), pp. 516–521*).—This paper deals with the relation between the agricultural college and the state normal school in the preparation of teachers mainly as an administrative and only incidentally as a pedagogical subject. The conclusion is reached that rural and elementary grade teachers should receive their preparation in agriculture in the state normal school, while all other teachers giving instruction in agriculture should be prepared in the college of agriculture. The reasons given for this conclusion are based on the fundamental conditions inherent in the two classes of institutions in most of the States.

How the adoption of a course of study in agriculture and related subjects would help the public schools, J. MAIN (*Addresses and Proc. Nat. Ed. Assoc., 51 (1913), pp. 808–812*).—In this discussion the author shows how the adoption of a uniform high school course in agriculture would make possible the training of teachers in secondary agricultural pedagogy; would enhance the utilitarian value of high school agriculture by the elimination of "freak courses" and valueless exercises and the inclusion of essentials duly proportioned; would make possible the accrediting of schools and the evaluation of agriculture as a preparatory training, and permit the student of agriculture to carry to distant schools an intelligible report of work completed just as he now may in Latin or algebra; and would save the sciences and the scientific methods to the high school from which they are in danger of being lost.

Report of the committee on courses of study in agriculture, E. C. BISHOP (*Addresses and Proc. Nat. Ed. Assoc., 51 (1913), pp. 804–807*).—Among the topics reported on are a unified course of study, development of project work, home and school gardening, farm management, farm mechanics, agricultural booklet, community survey, and boys' and girls' club work, preparation of teachers, use of text-books, made-up-text and theme-book, credit for home work, and personal, home, and community hygiene.

Agriculture and gardening in the public schools, C. F. PALMER (*Addresses and Proc. Nat. Ed. Assoc., 51 (1913), pp. 812–818*).—In this discussion the author contends that agriculture is as important a subject in the city schools as in the country schools, the differences lying more in the opportunities for carrying on the work and the outside experience that the pupils bring to it than in any innate differences between country and city youths. The work in school gardening in Los Angeles, one of the few large cities of this country conducting the work as a definite part of their educational system, is described in detail from the author's personal experience as supervisor of agriculture in the public schools. Gardening has been in operation in a number of schools with varying degrees of success for several years but has demonstrated its value, and over a year ago led to the establishment of a department of agriculture consisting of a supervisor, assistant supervisor, and three special teachers. Each of the four assistants was assigned a definite section of the city to develop. Headquarters for conferences with teachers and the distribution of seeds, plants, cuttings, etc., have been provided. Weekly classes in agriculture for teachers have been conducted under the auspices of the state university which through this department established its first extension course in agricultural teaching.

In what way can the nature-study movement be of assistance to agricultural teaching and social center work for rural communities, J. H. PAUL (*Addresses and Proc. Nat. Ed. Assoc., 51 (1913), pp. 803, 804*).—The author

outlines briefly three courses in nature study offered by the School of Education of the University of Utah, one of which is required of all regular normal students. Primary and kindergarten students take the course that deals primarily with trees, the forest, and forest life, intermediate grade teachers the course that deals with the local weeds, minerals, and the native bird life of the Rocky Mountains, and those aiming to teach in higher grades study insect life in the fall, rocks and soils in the winter, and plant life in the spring. Each course bears three hours of college credit, or four hours if the laboratory work is taken.

[Reports of the general committee and subcommittees on horticultural courses] (*Proc. Soc. Hort. Sci., 10 (1913), pp. 47–63*).—In these reports three fundamental principles underlying the permanent improvement of horticultural teaching and a course in pomology are outlined by C. G. Woodbury, chairman of the general committee on horticulture and of the subcommittee on pomology.

J. W. Lloyd, chairman of the subcommittee on olericulture, reports that if anything like uniformity in instruction in vegetable growing is to be established in the agricultural colleges of this country, the first step must be an attempt to unify the scope, method, and thoroughness of instruction given in the courses already offered in common by a number of institutions rather than to bring about a similarity in the number of courses. It is recommended that not more than two courses in vegetable gardening be adopted by all the colleges at the present time, viz, a general elementary course at present offered in some form by 35 different institutions, and a more advanced course dealing specially with the commercial phases of vegetable production and distribution. Courses in vegetable growing are outlined.

A. C. Beal, chairman of the subcommittee on floriculture, gives a brief statement of the present status of instruction in floriculture in this country and recommends that the professional courses be preceded and founded upon thorough courses in the histology and morphology of plants, plant physiology, chemistry, soils, and fertilizers (plant pathology and economic entomology also being important subjects); that a range of glass of the commercial type is necessary as well as a man having good practical experience with the ability to teach; and that in the absence of suitable text-books the lecture method of presentation of the various subjects in commercial floriculture, with extensive reference reading and thoroughly practical and definitely planned laboratory work to supplement the lectures, be utilized.

The problem of coordinating secondary school and college courses in horticulture, W. J. Wright (*Proc. Soc. Hort. Sci., 10 (1913), pp. 9–13*).—The author points out some of the reasons for the difficulty experienced in coordinating secondary school and college courses in horticulture.

The relation of horticultural practices to the horticultural curriculum, C. I. Lewis (*Proc. Soc. Hort. Sci., 10 (1913), pp. 14–18*).—After briefly outlining the field of the college horticultural graduate the author discusses the feasibility of various means of increasing the practical training of such graduates, viz, by following the European system of establishing trade schools, the requirement of more secondary training in horticulture, the establishment of secondary or trade schools within the colleges, the requirement of horticultural experience for admission to college courses, increasing the number of credits for the 4-year course by teaching horticulture during the entire year, requiring the horticultural graduate to spend a certain time in practical work after graduating, and the adoption of the apprenticeship system. He also discusses the amount of laboratory and field work that can be done consistently in horticultural courses with the number of credits at present required in the average

college, the equipment necessary to give the proper training, the relation of training given for professional lines to that given for practical lines, and the introduction of a new college course requiring each senior to take a half-year course in which the principles and practice will be combined.

College courses in the harvesting and marketing of fruits and vegetables, W. G. Brierley (*Proc. Soc. Hort. Sci., 10 (1913), pp. 25–30*).—A course in harvesting and marketing fruits and vegetables is outlined. The work can be given in one continuous course or may be divided into two separate courses. Allowance must be made for approximately 40 lectures with the necessary time for reviews and quizzes and at least 16 laboratory periods and time for a considerable amount of assigned reading.

Growing prize corn, P. G. Holden (*Philadelphia, 1914, pp. 48, figs. 69*).—This booklet has been prepared for the particular use of boys, and the text and illustrations have been taken from the author's Corn Secrets (E. S. R., 25, p. 34).

Progress of agricultural education in 1912–13, F. B. Jenks and C. H. Lane (*Rpt. Comr. Education [U. S.], 1913, I, pp. 211–233*).—This is a review for 1913 of the leading features of progress in agricultural education in this country and abroad, including the agricultural education work of this Department, the Graduate School of Agriculture, and educational and other conventions.

Agricultural education [in Latin America], E. E. Brandon (*U. S. Bur. Ed. Bul., No. 30 (1912), pp. 104–114, pls. 4*).—This chapter gives an account of the beginnings and present organization of agricultural instruction in Latin-American countries, expenditures for and dissimilarities in organization of their agricultural colleges, their admission requirements and curriculum, grades, and agricultural careers of students, number, physical equipment, courses of study, and types of elementary agricultural schools, and an agricultural normal school in Argentina.

Agricultural education in the Republic of Argentina, T. Amadeo and C. Vallejo (*La Enseñanza Agrícola en la República Argentina. Buenos Aires: Min. Agr., 1913, pp. 312, figs. 330*).—This is an account, prepared for the International Exposition at Ghent, of the system of agricultural instruction and experimentation in Argentina, and its development beginning with the establishment of the first practical school of agriculture in 1823.

Thirteenth annual general report of the Department of Agriculture and Technical Instruction for Ireland (*Dept. Agr. and Tech. Instr. Ireland, Ann. Gen. Rpt., 13 (1912–13), pp. VI+363*).—This is the report of the department's administration and funds and on the details of its work during 1912–13, including agricultural and technical instruction.

Christchurch Technical College agricultural department (*Jour. Canterbury Agr. and Past. Assoc., 3. ser., 2 (1914), pp. 37–39*).—An account is given of the theoretical and practical instruction in agriculture at this college.

Agricultural pupil scheme, W. G. Freeman (*Bul. Dept. Agr. Trinidad and Tobago, 13 (1914), No. 79, pp. 89–94*).—This is an outline of a scheme which has been approved by the board of agriculture of Trinidad for the training of students at least 16 years of age for such positions as overseers of estates. The course of theoretical and practical instruction extends over three years, the first two on estates managed by the department of agriculture and the third on an approved private estate. The expenses are to be defrayed from the profits made on the estates. The admission requirements, curriculum, and cost of the scheme are given.

Agricultural education, R. H. Rijkens (In *De Nederlandsche Landbouw in het Tijdvak 1813–1913. The Hague: Dept. Landb. [1913], pp. 91–130*).—The

author gives a detailed history of the development of agricultural education in the Netherlands.

The feminist movement in agriculture, ODETTE BUSSARD (*Vie Agr. et Rurale, 3 (1914), No. 23, pp. 625–628*).—The author describes the facilities for instruction in agriculture and home economics for women in France, viz, the High School of Agriculture and Home Economics at Grignon, 38 local schools of agriculture and home economics, farm women's clubs, and women's sections in large agricultural societies.

The exhibition of rural school work, ANNA B. COMSTOCK (*Nature-Study Rev., 10 (1914), No. 5, pp. 161–167, figs. 6*).—A description is given of a nature study exhibit by the rural schools of New York State during Farmers' Week at the College of Agriculture of Cornell University.

Agricultural extension service (*Wisconsin Sta. Bul. 240 (1914), pp. 55–87, figs. 20*).—An account is given of the activities of the extension service, which embrace (1) demonstration work of the different departments, mainly carried on under field conditions; (2) the county agricultural representative system in which resident instructors are located in the several counties; and (3) the combined activities given in connection with the farmers' courses, schools, trains, etc.

MISCELLANEOUS.

Report of the director, 1913, H. L. RUSSELL (*Wisconsin Sta. Bul. 240 (1914), pp. 98, figs. 54*).—This contains the organization list, a report of the work of the station during the year, portions of which are abstracted elsewhere in this issue, brief summaries of the publications of the year, and a financial statement for the federal funds for the fiscal year ended June 30, 1913.

List of publications of the Kentucky Agricultural Experiment Station (*Kentucky Sta. Bul. 181 (1914), pp. 156–166*).—A complete list of the publications of the station since its establishment.

NOTES.

Connecticut State Station.—H. K. Hayes, in charge of plant breeding work, has accepted an appointment as associate professor of agronomy and associate agronomist at the Minnesota University and Station beginning January 1, 1915.

Idaho University and Station.—F. L. Kennard, professor of field crops and farm management and agronomist, has been appointed instructor of agronomy and agronomist at the Minnesota substation at Crookston, vice O. I. Bergh, who has been transferred as superintendent of the Grand Rapids (Minn.) substation. J. F. Nicholson, bacteriologist of the university and station, has resigned.

Illinois University.—Citizens of Spring Valley, Bureau County, have donated to the university for experimental purposes 17 acres of land near a local high school. A similar offer of 20 acres of land near Kewanee, Henry County, has been made by Thomas McNamara.

Maine University.—V. G. Aubrey, instructor in animal industry, has been appointed extension specialist in poultry in Rutgers College.

Minnesota Station.—Alex Carlyle, assistant in plant breeding, has accepted the superintendency of the experiment farm established in connection with the new provincial school of agriculture at Vermilion, Saskatchewan.

Missouri University and Station.—The biology building authorized by the last legislature is now in use by the departments of zoology and botany. It is a 2-story and basement structure 220 feet long by 60 feet wide and cost $110,000. It has been designed specifically for biological work and contains many features of interest to experimenters along this line. It is regarded as probably the most modern laboratory building on the university campus. J. B. Rand has been appointed extension assistant in animal husbandry and veterinary science, and assigned to the hog cholera eradication work.

Nebraska University.—J. E. Miller, of Lincoln, and E. P. Brown, of Arbor, have been elected regents for a six-year term beginning January 1, 1915, succeeding George Coupland and C. E. Anderson. P. L. Hall, of Lincoln, has been appointed regent, vice C. S. Allen, resigned, this appointment holding until the next general election.

New Mexico College.—Miss Dora Edna Ross, of the extension division of the University of Missouri, has been appointed to take charge of the extension work in home economics.

North Carolina College and Station.—F. B. Sherwood has been transferred from the position of instructor in chemistry in the college to that of assistant chemist in the station.

Ohio State University.—Malon Yoder, of the department of agronomy, has been appointed assistant in grain standardization in this Department with headquarters at Portland, Oreg.

Vermont University.—E. L. Ingalls has been appointed in charge of the agricultural club work in the public schools.

Wisconsin University and Station.—Hjalmar O. Watrud has been appointed extension instructor in agricultural economics in the college of agriculture and assistant in agricultural economics in the station.

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INDEX OF NAMES.

INDEX OF SUBJECTS.

NOTE.—The abbreviations "Ala. College," "Conn. State," "Mass.," etc., after entries refer to the publications of the respective experiment stations; "Alaska," "Guam," "Hawaii," and "P. R." to those of the experiment stations in Alaska, Guam, Hawaii, and Porto Rico; "Can." to those of the experiment stations in Canada; and "U.S.D.A." to those of this Department.

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U. S. DEPARTMENT OF AGRICULTURE

OFFICE OF EXPERIMENT STATIONS

A. C. TRUE, DIRECTOR

Vol. XXXI ABSTRACT NUMBER No. 9

EXPERIMENT STATION RECORD

WASHINGTON
GOVERNMENT PRINTING OFFICE
1914

U. S. DEPARTMENT OF AGRICULTURE.

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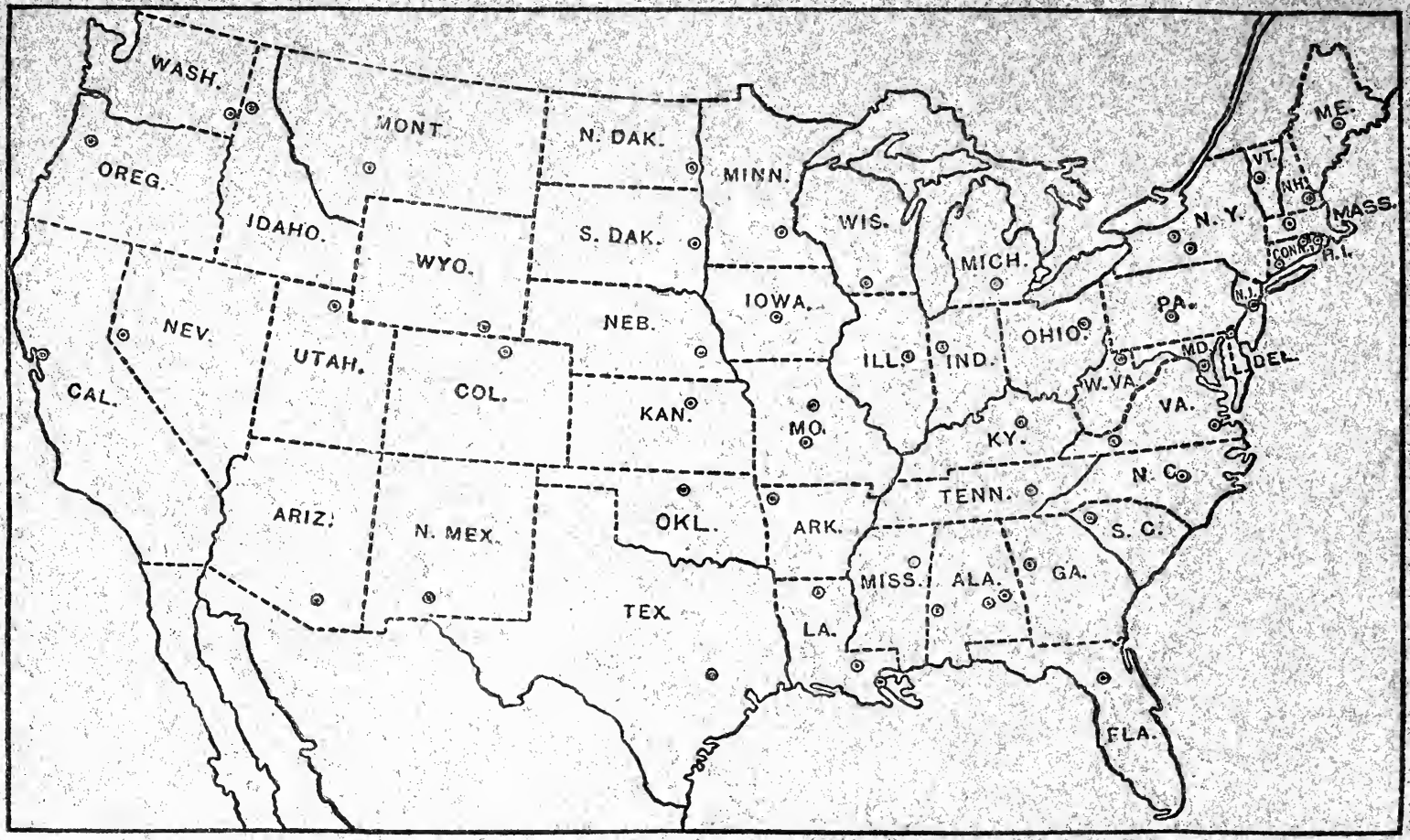

THE AGRICULTURAL EXPERIMENT STATIONS OF THE UNITED STATES.